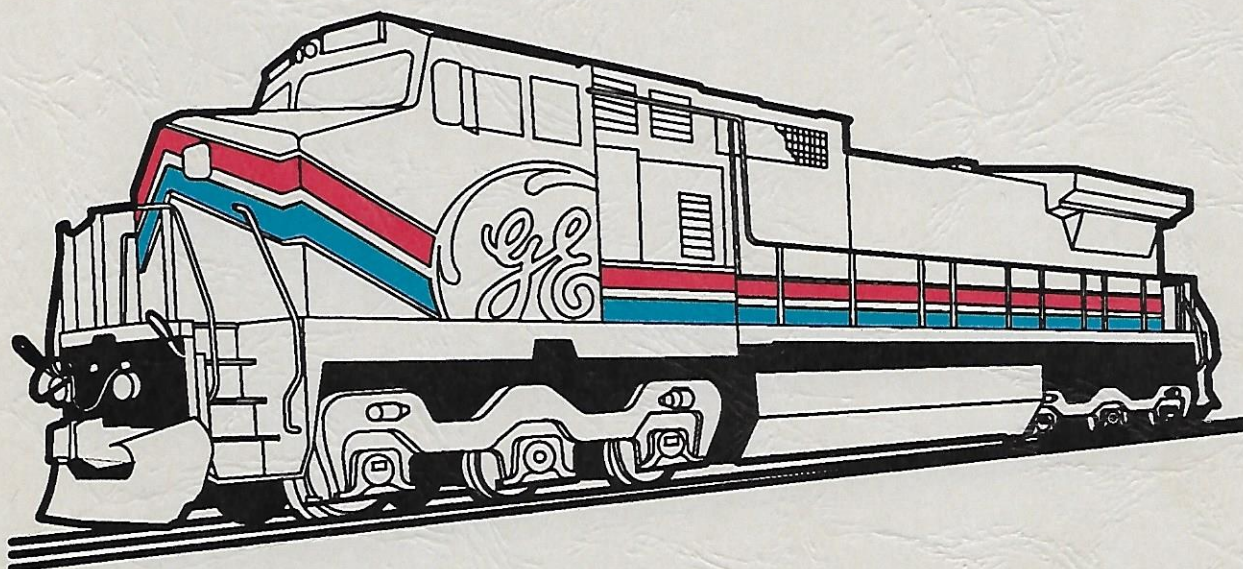




GEJ-6799

DASH 9 Locomotive



Operating Manual

OPERATING MANUAL

DASH 9-40CW DIESEL-ELECTRIC LOCOMOTIVES

***WITH INTEGRATED FUNCTION CONTROL
AND ELECTRONIC AIR BRAKE***

***FOR NORFOLK SOUTHERN CORPORATION
ROAD NUMBERS: 9129-9244***

© Copyright 1998 General Electric Company. All rights reserved. This copyrighted document may be reproduced free of charge by General Electric Company customers, if such reproduction is used exclusively in connection with equipment used in that customer's internal operation.

These instructions do not purport to cover all details or variations in equipment nor to provide for every possible contingency to be met in connection with installation, operation, or maintenance. Should further information be desired or should particular problems arise which are not covered sufficiently for the user's purposes, the matter should be referred to the General Electric Company. Any applicable Federal, State or local regulations or company safety or operating rules must take precedence over any instructions given in this material. GE has no obligation to keep the material up to date after the original publication.

THERE ARE NO WARRANTIES OF ACCURACY, MERCHANTABILITY OR FITNESS FOR PARTICULAR PURPOSE.

Verify numbers for parts, tools, or material by using the Renewal Parts or Tool Catalogs, or contact your General Electric representative for assistance. Do not order from this publication.

FOREWORD

NOTE: *The purpose of this manual (and the data included) is to act as a "guide" in the operation of this locomotive. The presence or absence of coverage for any particular system or component in no way implies that the equipment is or is not part of any specific locomotive. Minor differences encountered in equipment are because of changes made after the manual was released for printing. These changes will be covered in subsequent editions of this manual. For further details, refer to the Training Modules and the Locomotive RUNNING MAINTENANCE and BACKSHOP manuals.*

WELCOME to the GE DASH 9-40CW Locomotive. This locomotive is equipped with Electronic Air Brake (EAB) and Integrated Function Control (IFC) –an integrated control system enabling the crew to have the important operating parameters (brake setup, gages, annunciator lights, etc.) at their finger tips. This concept will be explained further in the INTRODUCTION Section of this manual.

In an effort to maintain a consistency of terminology between this unit and the other General Electric units (as well as other manufacturer units) in the fleet, the front of this unit will be called "short hood" (marked with an **F**) and the rear of this unit will be called "long hood".

This Operating Manual is arranged in sections: SUMMARY OF WARNINGS AND CAUTIONS, INTRODUCTION, OPERATING CONTROLS, DIAGNOSTIC SYSTEM, AIR BRAKE EQUIPMENT, OTHER EQUIPMENT, ALARMS/SAFEGUARDS, OPERATION and a grouping of the various functions available (e.g.: End Of Train; Power Reduction). Locate these needed sections easily by using the following CONTENTS Section.

The SUMMARY OF WARNINGS AND CAUTIONS Section lists (in one place) certain safety-related conditions which require specific action. They are repeated in the text where needed. **Please read this section now, before proceeding to other sections of this Manual.**

The INTRODUCTION Section describes and gives a basic overview of the IFC and Electronic Air Brake systems and along with Figure 2 (*Typical Location Of Apparatus*), gives a general overview of the locomotive. The OPERATING CONTROLS Section continues this overview by identifying the associated hardware located in the operating compartment of the nose cab. A brief description of the equipment is also included.

The AIR BRAKE EQUIPMENT Section lists and explains some of the principal parts of the system.

The OTHER EQUIPMENT Section lists and explains control equipment found in Control Areas (See Fig. 2) 1, 2, 3, 4, 5 and 9. Also included in this section are illustrations and text explaining the Engine Start Station, Water System Draining and important Gages of which the operator should be aware.

The ALARMS Section lists, describes and illustrates the various Alarms, Safeguards, Power Derations and Shutdown Situations an operator may encounter. The sections on Overspeed and Wheel slip will be of great interest.

The OPERATING PROCEDURES Section gives step-by-step instructions for locomotive operation as well as listing various functions available for use. The sections on Dynamic Braking and use of Air Brakes will be of great interest. This section is included last in the manual for operator convenience along with a grouping of the various control functions (End Of Train, Electronic Air Brake, Power Reduction, etc.) included on this locomotive.

The DASH 9-40CW locomotive responds to the operating environments and specific power applications needed by our customers. The refined operating system (IFC/EAB) results in improved ergonomics, higher reliability and less clutter in the cab. The equipment displayed and explained in this manual is the next step in General Electric Transportation Systems program to enable a complete, totally-integrated, computer control of the locomotive. Future enhancements will be developed and added as technology advancement allows. **Comments are appreciated.** Please send any comments to your local GE representative or mail to:

GENERAL ELECTRIC CO.
2901 East Lake Road
Erie, PA 16531
Attn: Manager Tech. Documentation
(Bldg. 14-1)

■ Revisions are indicated by marginal bars.

CONTENTS

	Page
SUMMARY OF WARNINGS AND CAUTIONS	1
INTRODUCTION TO INTEGRATED FUNCTION CONTROL AND GENERAL LOCOMOTIVE DATA	3
GENERAL INFORMATION	3
INTEGRATED FUNCTION COMPUTER (IFC)	3
INTEGRATED FUNCTION DISPLAY (IFD)	3
ELECTRONIC AIR BRAKE SYSTEM	4
GENERAL LOCOMOTIVE DATA	6
OPERATING CONTROLS	7
INTRODUCTION	7
DEVICES ON CONTROL STAND	7
DEVICES ON ENGINE CONTROL PANEL	15
DEVICES ON THE OVERHEAD CONSOLE	17
DEVICES IN CREW MEMBER'S AREA	19
OTHER OPERATING CAB FEATURES	19
DIAGNOSTIC DISPLAY SYSTEM (DID)	21
GENERAL INFORMATION	21
THE DISPLAY	21
MESSAGES AT LOCOMOTIVE START-UP	22
OPERATING MODES IN LEVEL 1	22
EXAMPLE – LEVEL 1 OPERATION	25
LIST OF SUMMARY MESSAGES	28
AIR BRAKE EQUIPMENT	29
ELECTRONIC AIR BRAKE SYSTEM	29
AIR BRAKE EQUIPMENT IN AIR BRAKE COMPARTMENT	30
CUT-OUT COCKS	31
OTHER EQUIPMENT	35
CONTROL COMPARTMENT EQUIPMENT	35
EQUIPMENT AND EXHAUST BLOWERS AND RADIATOR FAN	38
AIR COMPRESSOR	41
ENGINE START STATION AND START SWITCH	42
MISCELLANEOUS EQUIPMENT	42
PRESSURE AND TEMPERATURE GAGES	42
OTHER GAGES	43
DRAINING COOLING WATER SYSTEM	43
ALARMS, SAFEGUARDS, POWER DERATIONS AND SHUTDOWNS	47
BARRING-OVER SWITCH	47
EMERGENCY SANDING	47
ENGINE AIR FILTER PRESSURE SWITCH (EFPS)	47
GROUND CUT-OUT SWITCHES	47
MOTOR AND SPEED SENSOR CUT-OUT SWITCHES	47
OIL AND WATER TEMPERATURE AND PRESSURE	48
OVERSPEED – ENGINE SHUTDOWN	48
PCS FUNCTION OPERATION	49
WHEELSLIP	49
ALERTER	49
OPERATING PROCEDURES	51
ON POWERUP	51
Table 1. IFD Screen Flow Chart	52
Table 2. IFD Screen Tree	53
PREPARATION FOR OPERATION	55
Before Boarding Locomotive	56
After Boarding Locomotive	56
Starting The Engine	56
Cold Weather Engine Starting/Warm-up	57
Faster Air Pumping	57
Before Moving Locomotive	58

CONTENTS (Cont'd)

	Page
OPERATING PROCEDURES	59
Moving A Train	59
Stopping A Train	59
Reversing A Locomotive	60
Passing Through Water	60
Passing Over Railroad Crossings	60
Stopping The Engine	60
Before Leaving The Locomotive	60
Safety Controls	60
Dynamic Brake Operation	61
Operating As A Lead Unit	61
Operating As A Trail Unit	62
Changing Operating Ends	62
To Operate With Other Types Of Units	63
Dead Heading (Dead-In-Train)	63
DISTANCE COUNTER (SCREEN 310 000)	67
INTRODUCTION	68
OPERATION	68
ELECTRONIC AIR BRAKE (SCREEN 320 000)	71
INTRODUCTION	72
OPERATION	72
ELECTRONIC AIR BRAKE SETUP, LEAD	74
ELECTRONIC AIR BRAKE SETUP, TRAIL	74
ELECTRONIC AIR BRAKE REMOTE SESSION	75
AIR BRAKE TROUBLESHOOTING	76
Table 3. Emergency Or Penalty Brake Warning Indications	76
END OF TRAIN (SCREEN 332 000)	77
INTRODUCTION	78
OPERATION	79
Table 4. End Of Train Indications	79
OPERATING PROCEDURE	79
SPEED CONTROL (SCREEN 350 000)	81
INTRODUCTION	82
OPERATION	83
OPERATOR TEST MENU (SCREEN 360 000)	87
INTRODUCTION	88
OPERATION	89
OPERATOR FAULT RESET (SCREEN 600 000)	93
INTRODUCTION	94
OPERATION	95
OPERATOR SCREEN CONTROLS (SCREEN 700 000)	97
INTRODUCTION	98
OPERATION	98

LIST OF FIGURES

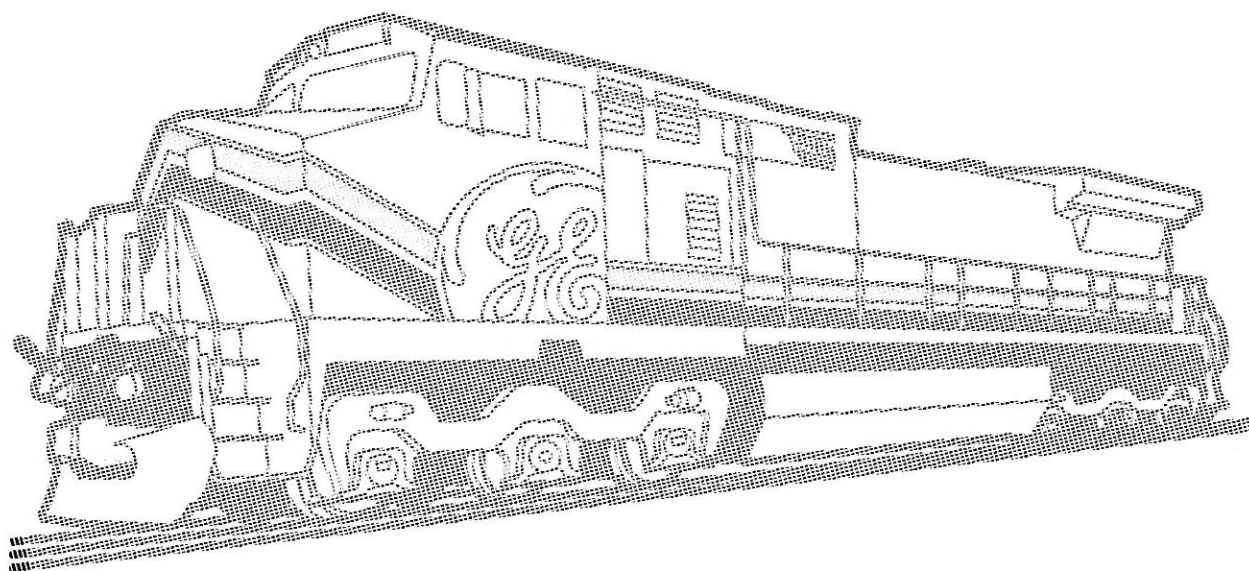
Fig.	TITLE	Page
1	INTEGRATED FUNCTION CONTROL SYSTEM OVERVIEW	4
2	TYPICAL LOCATION OF APPARATUS	5
3	OPERATOR CONTROL STAND	8
4	SAMPLE OPERATION SCREEN	9
5	SAMPLE OPERATION SCREEN INFORMATION AREAS	10
6	ENGINE CONTROL PANEL	16

LIST OF FIGURES (Cont'd)

Fig.	TITLE	Page
7	OVERHEAD CONSOLE	18
8	CREW MEMBER'S AREA	19
9	TYPICAL TOILET COMPARTMENT	20
10	ENGINEER'S AND CREW MEMBER'S OVERHEAD DOME LIGHT AND WIPER CONTROLS (TYPICAL)	20
11	DIAGNOSTIC DISPLAY PANEL	21
12	GE HARRIS CCBII AIR BRAKE CONTROL UNIT (TYPICAL)	30
13	MAIN RESERVOIR CUT-OUT COCK, MAIN AND AUXILIARY FILTERS AND DRAINS (TYPICAL)	31
14	TYPICAL ELECTRONIC AIR BRAKE EQUIPMENT LOCATIONS	32
15	TYPICAL GE HARRIS CCBII ELECTRONIC BRAKE EPCU ASSEMBLY	33
16	LOCOMOTIVE SHORT-HOOD ASSEMBLY AND END CONNECTIONS	34
17	LOCATION OF CONTROL AREAS	35
18	CONTROL AREA 1	36
19	CONTROL AREA 2	37
20	CONTROL AREA 3	37
21	CONTROL AREA 4	38
22	CONTROL AREA 7	39
23	CONTROL AREA 8	39
24	CONTROL AREA 9	40
25	LOCATION OF EQUIPMENT, DYNAMIC BRAKE, EXHAUSTER AND ALTERNATOR BLOWERS, ELECTRONIC PARKING BRAKE AND RADIATOR FAN	40
26	AIR COMPRESSOR CONTROL PANEL (CCP) AND PIPING	41
27	SPLIT COOLING WATER CONTROL MAGNET VALVE (SCS) PANEL	42
28	ENGINE START STATION	43
29	ENGINE COOLING WATER SIGHT GLASS (TYPICAL)	44
30	DIESEL ENGINE LUBRICATING-OIL DIPSTICK AND FILL	44
31	"B" SIDE OF FUEL TANK (TYPICAL)	44
32	AIR COMPRESSOR LUBRICATING-OIL DIPSTICK (TYPICAL)	45
33	ENGINE COOLING WATER DRAIN (TYPICAL)	45
34	ENGINE BARRING-OVER SWITCH	47
35	MAIN OPERATION SCREEN (000 000)	54
36	OPERATOR FUNCTION SCREEN (300 000)	55
37	DISTANCE COUNTER SCREEN (310 000)	68
38	DISTANCE COUNTER PRESET SCREEN (315 000)	69
39	ELECTRONIC AIR BRAKE SETUP SCREEN (320 000)	72
40	ELECTRONIC AIR BRAKE REMOTE SESSION SCREEN (326 000)	75
41	END OF TRAIN SETUP SCREEN (332 000)	78
42	SPEED CONTROL MENU SCREEN (350 000)	82
43	HUMP CONTROL SCREEN (351 000)	83
44	SLOW SPEED CONTROL SCREEN (353 000)	85
45	SET SPEED CONTROL SCREEN (353 600)	86
46	OPERATOR TEST SCREEN (360 000)	88
47	ALERTER TEST SETUP SCREEN (361 000)	89
48	ALERTER DEPARTURE TEST SCREEN (361 100)	90
49	MEASURED MILE TEST SCREEN (362 000)	91
50	OPERATOR FAULT RESET SCREEN (600 000)	94
51	OPERATOR SCREEN CONTROLS (700 000)	98
52	OPERATOR PASSWORD SCREEN (770 000)	99

©1998 GENERAL ELECTRIC COMPANY

NOTE: THESE INSTRUCTIONS ARE NOT INTENDED TO SUPERCEDE ANY EXISTING OR FUTURE RAILROAD RULES AND REGULATIONS. WHERE THERE IS A CONFLICT, RAILROAD RULES WILL GOVERN.



SUMMARY OF WARNINGS AND CAUTIONS

The following is a summary of safety precautions which must be observed when operating this General Electric Locomotive. WARNINGS indicate the potential for danger to personnel, and CAUTIONS indicate the potential for damage to the equipment. The Manual Section where the precaution is located is listed at the lower right-hand of the precaution. The precautions are repeated where applicable throughout the manual.

THESE INSTRUCTIONS DO NOT COVER ALL DETAILS OR VARIATIONS IN EQUIPMENT NOR PROVIDE FOR EVERY POSSIBLE CONTINGENCY TO BE MET IN CONNECTION WITH INSTALLATION, OPERATION, OR MAINTENANCE. SHOULD FURTHER INFORMATION BE DESIRED OR SHOULD PARTICULAR PROBLEMS ARISE WHICH ARE NOT COVERED SUFFICIENTLY FOR THE USER'S PURPOSES, THE MATTER SHOULD BE REFERRED TO GENERAL ELECTRIC COMPANY. ANY APPLICABLE FEDERAL, STATE OR LOCAL REGULATIONS OR COMPANY SAFETY OR OPERATING RULES MUST TAKE PRECEDENCE OVER ANY INSTRUCTIONS GIVEN IN THIS MATERIAL. PLEASE MAKE A NOTE OF ANY OF THESE RULES IN THE SPACE PROVIDED. GE HAS NO OBLIGATION TO KEEP THESE INSTRUCTIONS UP TO DATE AFTER THE ORIGINAL PUBLICATION. THERE ARE NO WARRANTIES OF ACCURACY, MERCHANTABILITY OR FITNESS FOR PARTICULAR PURPOSE.

CALIFORNIA Proposition 65 Warning

Diesel engine exhaust and some of its constituents are known to the State of California to cause cancer, birth defects, and other reproductive harm.

WARNINGS:

Finding the Braking Handle away from OFF or the Throttle Handle away from IDLE with the Reverse Handle removed indicates that interlocking between handles requires repair or adjustment. Do not attempt to operate unit until condition has been repaired.

OPERATING CONTROLS

To ensure safe consist operation, follow specific Railroad precautions for setting-up units for "Trail" or "Dead".

OPERATING CONTROLS, AIR BRAKE EQUIPMENT

STOPPING HAZARD. *Under no circumstances should a train be permitted to continue in operation if the brake pipe air pressure falls below 45 psi. If this situation occurs, the train must be stopped and the brake pipe recharged to the railroad particular setting. Failure to comply with this warning may result in the inability to control or stop the train.*

AIR BRAKE EQUIPMENT, OPERATING PROCEDURES, ELECTRONIC AIR BRAKE

STOPPING HAZARD. *In an EMERGENCY situation, when operating as a single unit or part of a multi-unit consist (locomotives only), moving the INDEPENDENT Brake Handle to FULL APPLICATION is the fastest way to develop brake cylinder pressure on the unit/consist up to the full independent brake cylinder pressure setting. Immediately after moving the INDEPENDENT Handle, move the AUTOMATIC Handle into EMERGENCY. Failure to comply with this procedure during an EMERGENCY situation, COULD EXTEND THE STOPPING DISTANCE.*

AIR BRAKE EQUIPMENT

STOPPING HAZARD. *Following an EMERGENCY BRAKE application, if the train is not at rest, brake release MUST NOT be attempted. Any movement of the AUTOMATIC Brake Handle to RELEASE while train is moving may cause equipment and/or personnel damage.*

AIR BRAKE EQUIPMENT, OPERATING PROCEDURES, ELECTRONIC AIR BRAKE

WARNINGS: (Cont'd)

High voltage is present in the Control Equipment compartment (Control Areas 2, 3 and 4) when locomotive is under load. When the door to this compartment is opened, the Door Interlock Switch (DIS) will trip causing the unit to drop power. As a safety precaution, before entering this compartment, open the Auxiliary Alternator Cut-Out switch (BFCO) located inside Control Area 1.

OTHER EQUIPMENT

To avoid personal harm from engine cooling water burns, when the water level is above FULL AT IDLE mark, NEVER remove the water fill cap. If over-full, open manual drain valve (near lubricating-oil pump) to reduce the water to a safe level. Also, a green indicating light is mounted near the water fill location. Shut the engine down and exercise extreme caution when opening the fill cap if this green light is NOT on.

OTHER EQUIPMENT

While servicing the air compressor, open Local Control Circuit Breaker (LCCB, Item 13, Fig. 6) to prevent air compressor motor from starting. Motor driven air compressor has hot surfaces and may operate at any time with diesel engine running. Do NOT service air compressor while hot and/or with diesel engine running.

OPERATING PROCEDURES

STOPPING HAZARD. Prior to train movement, Brake application/release and leakage tests MUST BE performed at the Railroad specified brake pipe pressure for the entire train. The brake pipe line is to be open throughout the train. Leakage observed and noted MUST BE within the specified permissible limit of five psi per minute. Once the acceptable leakage rate is obtained, NO MANUAL ADJUSTMENTS are to be made to alter the running brake pipe pressure setting while the train is at the terminal and standing still. Failure to comply with this procedure could result in the inability to control or stop the train.

OPERATING PROCEDURES

STOPPING HAZARD. If internal power loss and Locomotive battery power loss to the EPIC System occurs while train is in motion, a FULL SERVICE Brake application is made at a SERVICE rate (BP goes to zero). Operator may initiate an EMERGENCY Brake application from the EMERGENCY BRAKE VALVE located on the Crew Member's Desk.

OPERATING PROCEDURES, ELECTRONIC AIR BRAKE

CAUTIONS:

It is recommended that the traction motor cut-out switches be operated only with the Engine Control switch in START or ISOLATE position so the unit is isolated and the Throttle Handle in IDLE. Dynamic Brake operation will be affected.

OPERATING CONTROLS, ALARMS

Equipment damage may result – If a FAULT reoccurs soon after being reset, the operator should NOT attempt to reset the FAULT more than THREE TIMES until the cause of the FAULT has been determined and corrected.

DIAGNOSTIC DISPLAY SYSTEM

During freezing weather, protect the engine cooling system according to railroad instructions.

OTHER EQUIPMENT

Do not discharge the battery excessively by repeated attempts to start the engine. If the first two or three tries are unsuccessful, recheck the starting procedure.

OPERATING PROCEDURES

The control system of this locomotive will delay application of dynamic braking. If however, other locomotives in the consist do not have this feature, to prevent equipment damage when changing from power to dynamic braking or from dynamic braking to power, pause 10 seconds with the Throttle Handle at IDLE.

OPERATING PROCEDURES

After a locomotive engine has operated at full load, allow the engine to run at IDLE for at least five minutes before shutting down. Otherwise, immediate shutdown after such operation could be harmful to some engine components.

OPERATING PROCEDURES

To avoid equipment damage, properly set-up this locomotive when hauling dead-in-train.

OPERATING PROCEDURES

To avoid wheel flats when hauling dead-in-train, drain main reservoir of unit to less than 25 psi (172 kPa).

OPERATING PROCEDURES

INTRODUCTION TO INTEGRATED FUNCTION CONTROL AND GENERAL LOCOMOTIVE DATA

GENERAL INFORMATION

The *Integrated Function Control system* (Fig. 1) is divided into two major parts: the Integrated Function Computer (IFC) and the Integrated Function Displays (IFD). This integration system is used to integrate third party systems into the GE control system.

Along with the integrated control system, this locomotive is equipped with Electronic Air Brakes. The *Electronic Air Brake system* is divided into two main groups: the brake handles or controllers (Independent and Automatic) and the GE Harris CCBII ELECTRO-PNEUMATIC UNIT found in the air brake compartment.

The goals of this new control integration system are:

1. Provide the operator with more useful functional information.
2. Reduce clutter in the operating cab through the elimination of bolt-on boxes and redundant displays.
3. Improve equipment reliability through reduction of parts and connections.

IFC

The IFC is the communications center for all on-board locomotive control functions. The basic IFC function is to communicate data among the various on-board locomotive control functions such as:

1. Alerter control [and Audio/Visual Alarm Box (AVB)] systems located in the IFC system.
2. CAB, EXC and AUX controllers.
3. Diagnostic Display (DID) Panel.
4. IFDs mounted on Engineer's Control Stand.
5. Event Recorder – consisting of two parts: Permanent Core Memory (PCM) and Customized Recording Device (CRD) – data may be downloaded to a removable memory card.
6. End of Train (EOT) information through the Receiver Logic Unit (RLU).
7. Electronic Air Brake Control System.
8. Fuel Monitoring, Slow Speed, and Overspeed Systems.

IFD

The new Integrated Function Control System utilizes two IFDs (located on the Control Stand) which are fed information over a data link from the IFC and feed operator commands to the IFC. Each IFD is a ten-inch diagonal, backlighted, color graphics liquid crystal display (LCD) with up to eight menu soft keys arranged horizontally below the screen. Background color is black. Other screen colors have been chosen to attract the operator's attention: YELLOW for alarm or out-of-limit condition; RED for danger; BLUE, YELLOW and GREEN for bar graphs. Screen brightness is controlled using IFD soft keys. See **Operator Screen Controls** section of this publication. Brightness may be controlled to adjust for day, night or tunnel operation. In addition, 30 continuous minutes of operator inactivity will cause all displays to shut down (pressing any display key or alerter reset will restore operating brightness). The display also contains up to eight menu soft keys arranged horizontally below the screen.

Each IFD may independently display either the Function Screen or the Gage Screen.

NOTE: Each of the IFDs (Gage Display and Function Display) has its own independent distance counter.

Operation Screen

This screen (Fig. 4) replaces the former analog speedometer, ammeter, air and pressure gages mounted on the control stand. The Operation Screen also replaces the functional controls and displays of the bolt-on boxes covering

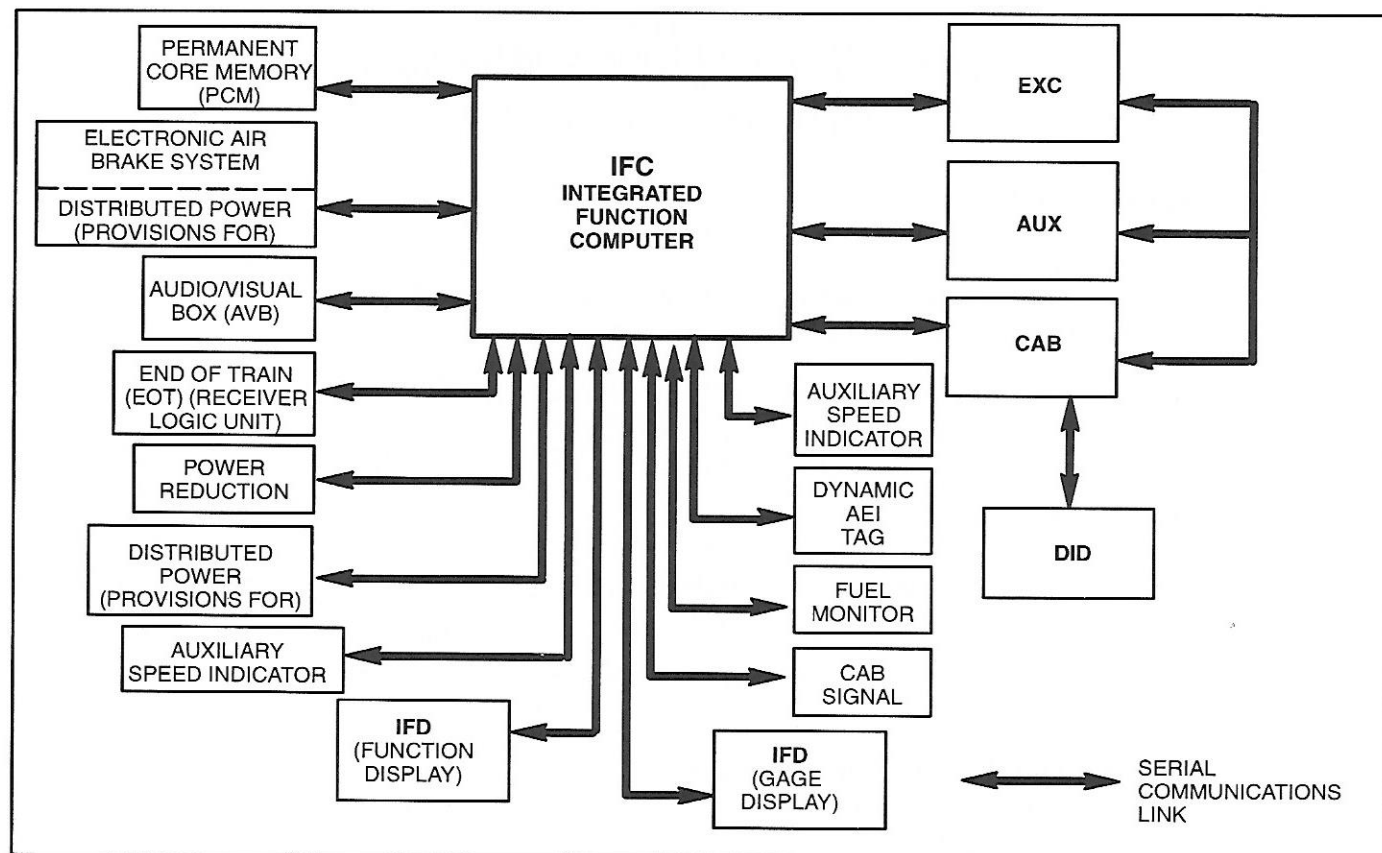


FIG. 1. INTEGRATED FUNCTION CONTROL SYSTEM OVERVIEW. E-43311.

End of Train, Alerter and Slow Speed systems. The screen will show both analog and digital readouts of Speed, Load and air pressure data. The air pressure data covers Main Reservoir, Equalizing Reservoir, Brake Pipe, Brake Cylinder, End of Train and Brake-Pipe Air Flow. Also shown on this screen is the Fuel, Slow Speed and Braking information. Digital readouts of usable fuel remaining, set speed and Brake set-up are centrally located.

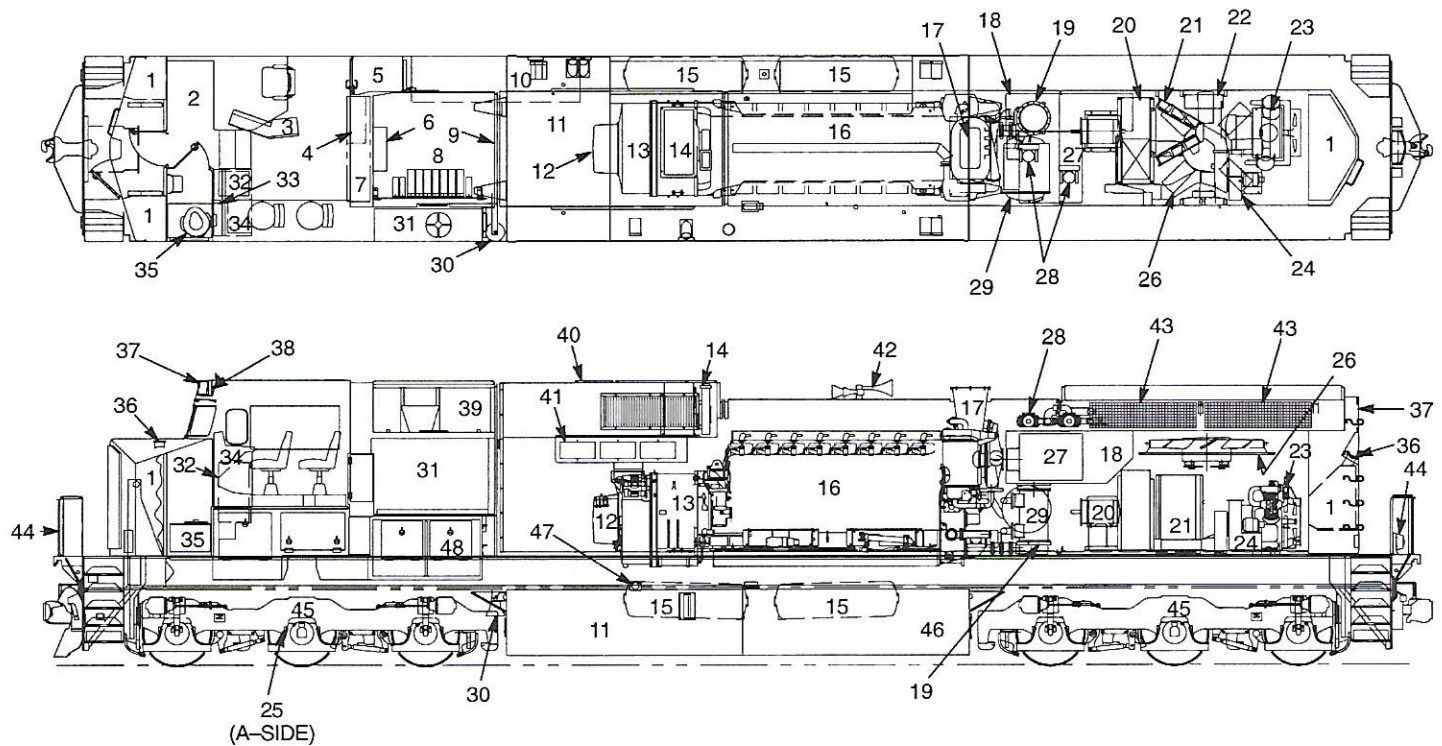
This screen also displays the annunciator lights for WHEEL SLIP, PCS OPEN, SAND, DYN BRAKE and PENALTY BRAKE formerly mounted on the control console. Included with the familiar annunciator lights are new lights: DISTRIBUTED POWER, EOT COMM, EOT BATT and EOT MOVE. See appropriate section of *Operating Controls* for more information.

ELECTRONIC AIR BRAKE SYSTEM

As a continuation of the Integrated Control concept to localize most of the control operation in front of the operator and to eliminate (as much as possible) pneumatic devices in the cab area, the electronic air brake control system has been developed and supplied on this unit. It is a microcomputer controlled system replacing pneumatic system valves and relays with electronic controls also located in the air brake rack.

NOTE: The GE Harris CCBII is an Electro-pneumatic system; that means the system needs locomotive battery power to function. Also, verify that the LEB Computer and Air Brake Computer circuit breakers (Items 3 and 10, Fig. 6) on the EC panel are properly positioned.

The elimination of much of the air brake control and pneumatic devices (through the use of the GE Harris CCBII Air Brake System) reduces the air connections increasing reliability while also simplifying unit troubleshooting. The Brake Control Computer and associated control devices (e.g., Transducers, Pressure Switches, Filter, etc.) are located in the GE Harris CCBII PNEUMATIC UNIT (EPCU) found in the air brake compartment (see **AIR BRAKE EQUIPMENT** Section of this manual).



REF.	DESCRIPTION	REF.	DESCRIPTION
1	SAND BOX	25	ELECTRIC PARKING BRAKE
2	ELECTRONIC EQUIPMENT LOCKER	26	RADIATOR FAN
3	CONTROL STAND	27	BAGGIE AIR FILTER BOX
4	ENGINE CONTROL PANEL	28	WATER CONTROL VALVES
5	CONTROL AREA #8 (CA8)	29	LUBRICATING OIL FILTER
6	CONTROL AREA #2 (CA2)	30	LOCOMOTIVE BELL
7	CONTROL AREA #1 (CA1)	31	HEATER/AIR CONDITIONER UNIT
8	CONTROL AREA #3 (CA3)	32	ICE CHEST RACK
9	CONTROL AREA #4 (CA4)	33	EMERGENCY BRAKE VALVE
10	BATTERY BOX	34	CREW MEMBER'S DESK
11	FUEL TANK	35	TOILET
12	AUXILIARY ALTERNATOR	36	SAND FILL
13	ALTERNATOR	37	HEADLIGHT
14	ALTERNATOR BLOWER	38	NUMBER LIGHT BOX
15	MAIN AIR RESERVOIR	39	DYNAMIC BRAKE BOX
16	ENGINE (7FDL16)	40	EQUIPMENT BLOWER BOX
17	ENGINE MUFFLER	41	RECTIFIERS
18	ENGINE WATER TANK	42	HORN
19	LUBRICATING OIL COOLER	43	RADIATOR
20	TRACTION MOTOR BLOWER	44	ROAD CROSSING LIGHTS
21	ENGINE AIR FILTER ARRANGEMENT	45	HiAd™ TRUCK
22	CONTROL AREA #9 (CA9)	46	RETENTION TANK
23	AIR COMPRESSOR	47	FUEL FILLER
24	DIRTY AIR EXHAUSTER BLOWER	48	CONTROL AREA #7 (CA7)

FIG. 2. TYPICAL LOCATION OF APPARATUS. E-43312.

GENERAL LOCOMOTIVE DATA

Operating Cab and Controls Wide Cab with Control Stand and IFC/EAB

Wheel Arrangement C-C

Engine Data:

Horsepower – Traction 3990

Number of Cylinders 16

Model GE 7FDL16

Bore and Stroke (in.) 9 X 10-1/2

RPM 1050

Compression Ratio 12.7:1

Cycle 4

Turbocharged Yes (7S1716)

Electronic Fuel Injection Yes (Bosch)

Engine Cooling Fan 1

Engine Cooling Fan Drive AC Motor

Traction Equipment:

Traction and Auxiliary Alternator GMG 197

Traction Motors (6) GE752AH™

Alternator Blower 1

Traction Motor Blower 1

Blower Drives AC Motors

Air Brake Schedule GE Harris CCBII Electronic System

Major Dimensions (Approximate):

Length 73 ft. 2 in.

Height 15 ft. 4 in.

Width 10 ft. 3 in.

Traction Pin Centers 50 ft. 4 in.

Truck Wheel Base 13 ft. 2 in.

Minimum Track Curvature (radius and degrees):

For Single Unit 273 ft./21°

For MU 273 ft./21°

Driving Wheel Diameter (in.) 42

Weight (lbs, nominal, ± 1.25%) 410,000

Maximum Continuous Tractive Effort (lbf) / Speed (mph) 105,560/11.6

Maximum Starting Tractive Effort (lbf) 142,000

Gear Ratio 83/20

Maximum Speed (mph) – worn wheels 70

Supplies:

Fuel Tank (gal.) 4900 (4350 Usable)

Coolant (gal.) 380

Lubricating Oil (gal.) 410

Sand (cu. ft.) 40

Compressor, Air:

Compressor Drive AC Motor

Maximum Displacement CFM 236

Type of Cooling Air

Lubricating Oil (gal.) 16

Air Filtering Devices: Primary Vortex, Self-Cleaning

Secondary Engine Air Intake AAF

Engine Room Pressurized Yes

Main Generator Pressurized Yes

™ Trademark of General Electric Co.

OPERATING CONTROLS

INTRODUCTION

All of the operating devices, manual and visual, normally used by the engineer during locomotive operation are located near the engineer's position. Most of these devices are located either on the Control Stand (Fig. 3), the Engine Control panel (Fig. 6) or the Overhead Console (Fig. 7).

DEVICES ON THE CONTROL STAND

NOTE: Numbers in parentheses () refer to items found on Figure 3 of this publication unless noted otherwise.

Crossing Lights Pulser Toggle Switch

Pressing this spring-loaded toggle switch (26) will turn ON the Road Crossing Lights (at any time) in the flashing mode for 30 seconds.

Horn Switch

Engaging this switch (1) will sound the locomotive horn (Item 42, Fig. 2) as long as the switch is depressed. The locomotive horn is interlocked with the bell (Item 30, Fig. 2) so that the bell will ring when the horn sounds. It is necessary to depress the Bell Switch (28) to silence the bell when it has been energized by this Horn Interlock.

EOT (rear) Emergency Brake Toggle Switch

Pressing this spring-loaded toggle switch (4) initiates an End Of Train Emergency Brake Application. Follow Railroad Rules and Regulations for operation of this switch.

Alerter Reset Whisker Switch

This switch (5) manually resets the Alerter System and prevents a penalty brake application from ensuing. For more information on the Alerter System, refer to appropriate paragraph located in **Alarms, Safeguards, Power Derations And Shutdowns** Section of this Operating Manual.

Crossing Lights Toggle Switch

This toggle switch (6) has three positions for continuously controlling the Road Crossing Lights: Up (for flashing), Center (off) and Down (for on). For the lights to be

steady ON (down position), the headlight switch (either 16 or 22) must be in the BRIGHT position.

Dynamic Brake Override Keyswitch and Indicating Light

This DPC OVER-RIDE switch (24) enables the override of Dynamic Brake cutout and turns on indicating light (7) during emergency braking. Follow Railroad Rules and Regulations for operation of this switch.

Step and Ground Lights Toggle Switch

This switch (8) turns on all step and ground lights.

Gage Light Switch

This switch (9) turns on the control stand cover lights for the circuit breakers and switches.

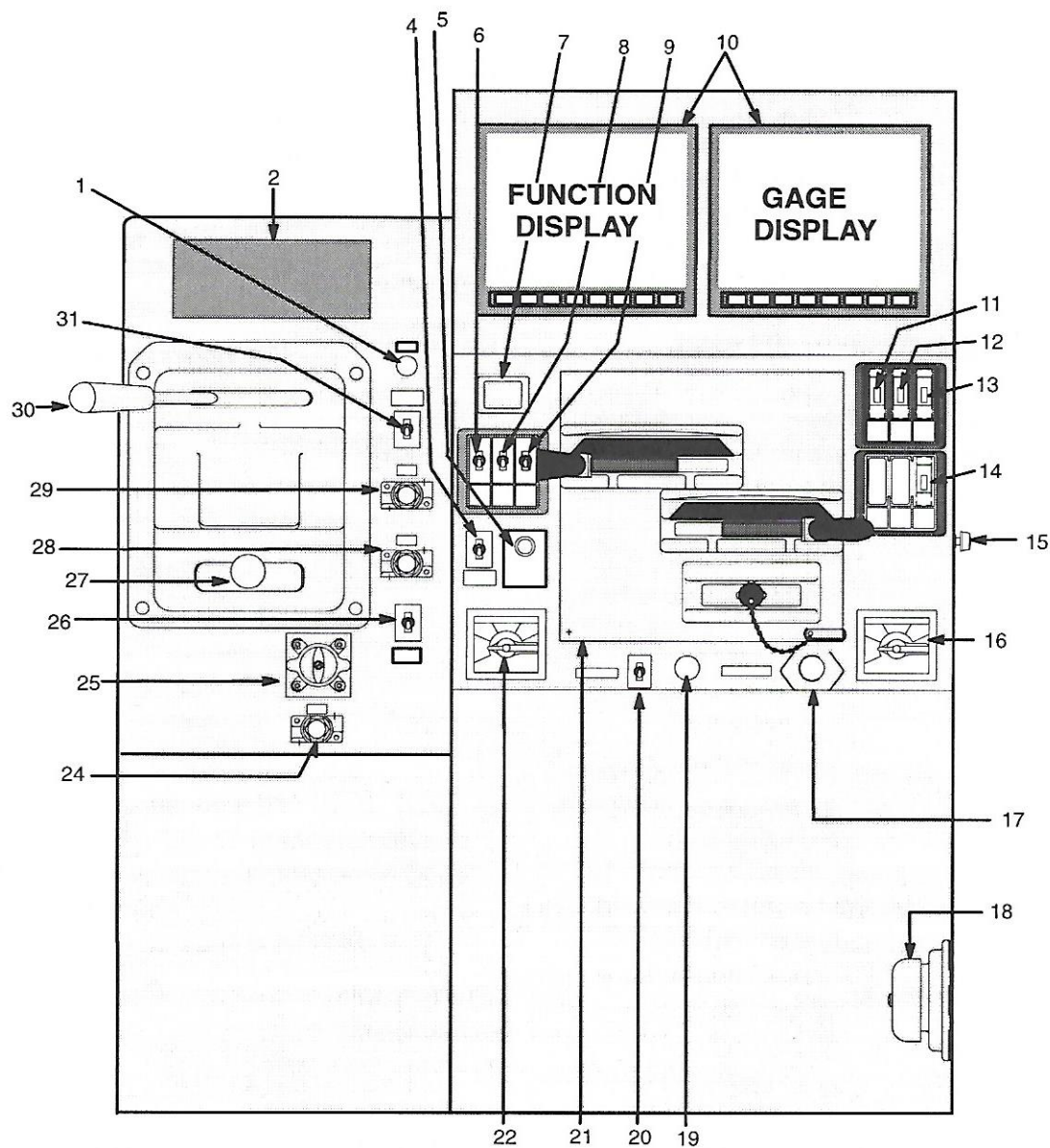
Integrated Function Displays

The Integrated Function Displays (IFDs) located on the control stand (10) are identical, ten-inch diagonal, backlighted, liquid crystal displays (LCD). On Power Up, both IFDs will display the Operation Screen (Fig. 4). Refer to the following for screen components:

NOTE: If any of the analog bars change color indicating an alarm or out-of-limit condition, the box surrounding the corresponding digital indication will turn yellow. When any field contains "**", the communications link has been lost.**

The following list of components corresponds with the numbered items presented on Figure 5, *Sample Operation Screen Informational Areas*:

1. **ER** – indicates Equalizing Reservoir pressure. The range for this digital marker is 0–200 psi. A digital reading of "****" indicates an out-of-range value from the corresponding transducer or that EAB is not communicating with IFC.
2. **BP** – indicates locomotive Brake-Pipe pressure. The range for this digital marker is 0–200 psi. A digital reading of "****" indicates an out-of-range value from the corresponding transducer or that EAB is not communicating with IFC.
3. **BC** – indicates Brake Cylinder pressure. The range for this digital marker is 0–200 psi. A digital reading of "****" indicates an out-of-range value from the corresponding transducer or that EAB is not communicating with IFC.



REF.	DESCRIPTION	REF.	DESCRIPTION
1	HORN SWITCH	17	SPOTTER RECEPTACLE
2	RADIO (REMOTE HEAD)	18	ALARM BELL
3	NOT USED	19	CAB SIGNAL ACKNOWLEDGE PUSHBUTTON
4	EOT REAR EMERGENCY BRAKE SWITCH	20	TRAINLINE GROUND RESET TOGGLE SWITCH
5	ALERTER RESET SWITCH	21	MASTER CONTROLLER
6	CROSSING LIGHT TOGGLE SWITCH	22	REAR (LONG-HEAD) HEADLIGHT SWITCH
7	DYNAMIC BRAKE OVERRIDE INDICATING LIGHT	23	NOT USED
8	STEP AND GROUND LIGHT SWITCH	24	DYNAMIC BRAKE OVERRIDE KEYSWITCH
9	GAGE LIGHT SWITCH	25	CROSSING LIGHTS SELECTOR SWITCH
10	INTERACTIVE FUNCTION DISPLAY (IFD)	26	CROSSING LIGHTS PULSER TOGGLE SWITCH
11	ENGINE RUN CIRCUIT BREAKER	27	INDEPENDENT BRAKE HANDLE
12	GENERATOR FIELD CIRCUIT BREAKER	28	BELL PUSHBUTTON
13	CONTROL CIRCUIT BREAKER	29	SAND SWITCH
14	DYNAMIC BRAKE CIRCUIT BREAKER	30	AUTOMATIC BRAKE HANDLE
15	GAGE LIGHT DIMMER	31	LEAD AXLE SAND SWITCH
16	FORWARD (SHORT-HOOD) HEADLIGHT SWITCH		

FIG. 3. OPERATOR CONTROL STAND. E-43313.

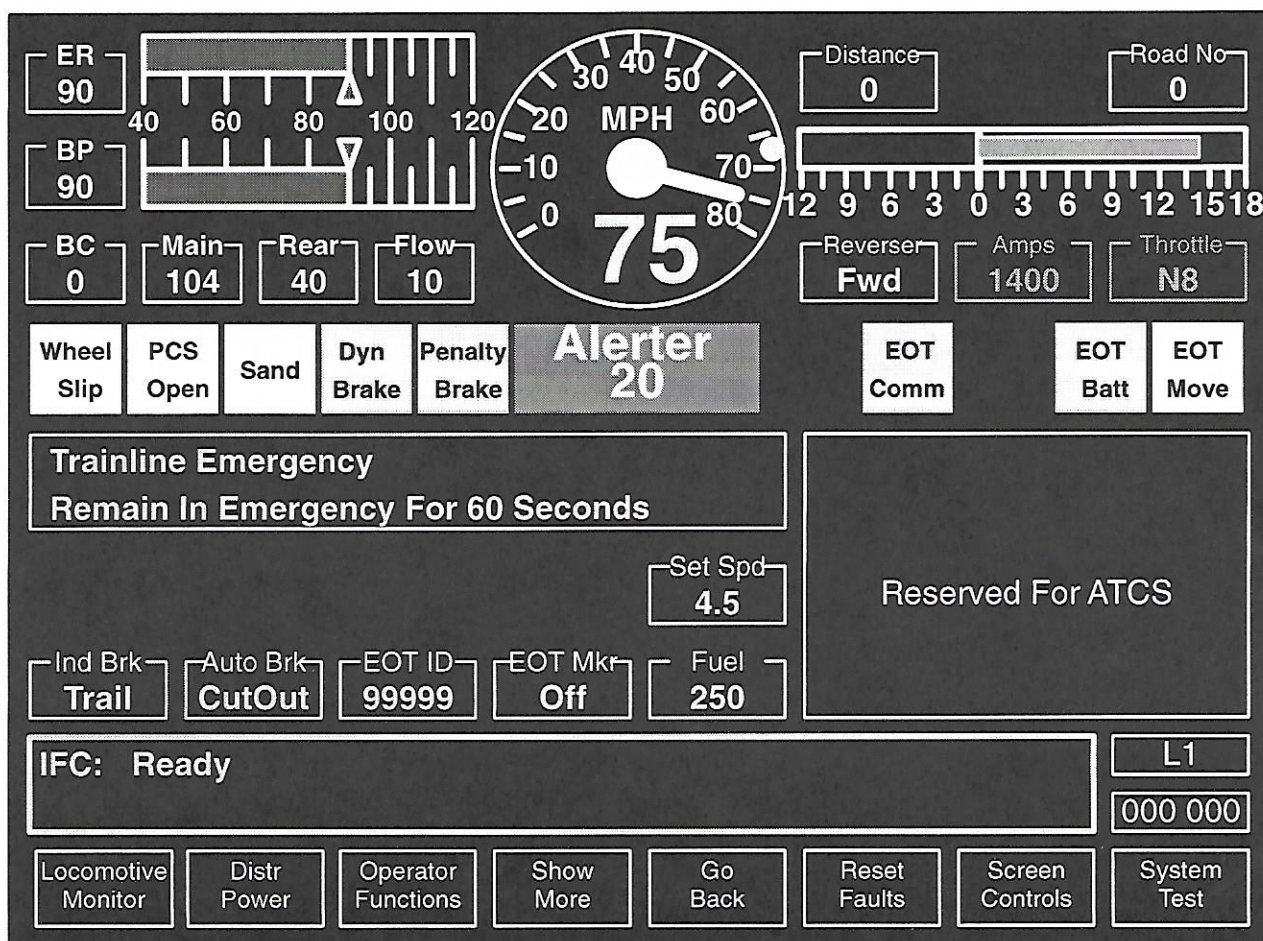
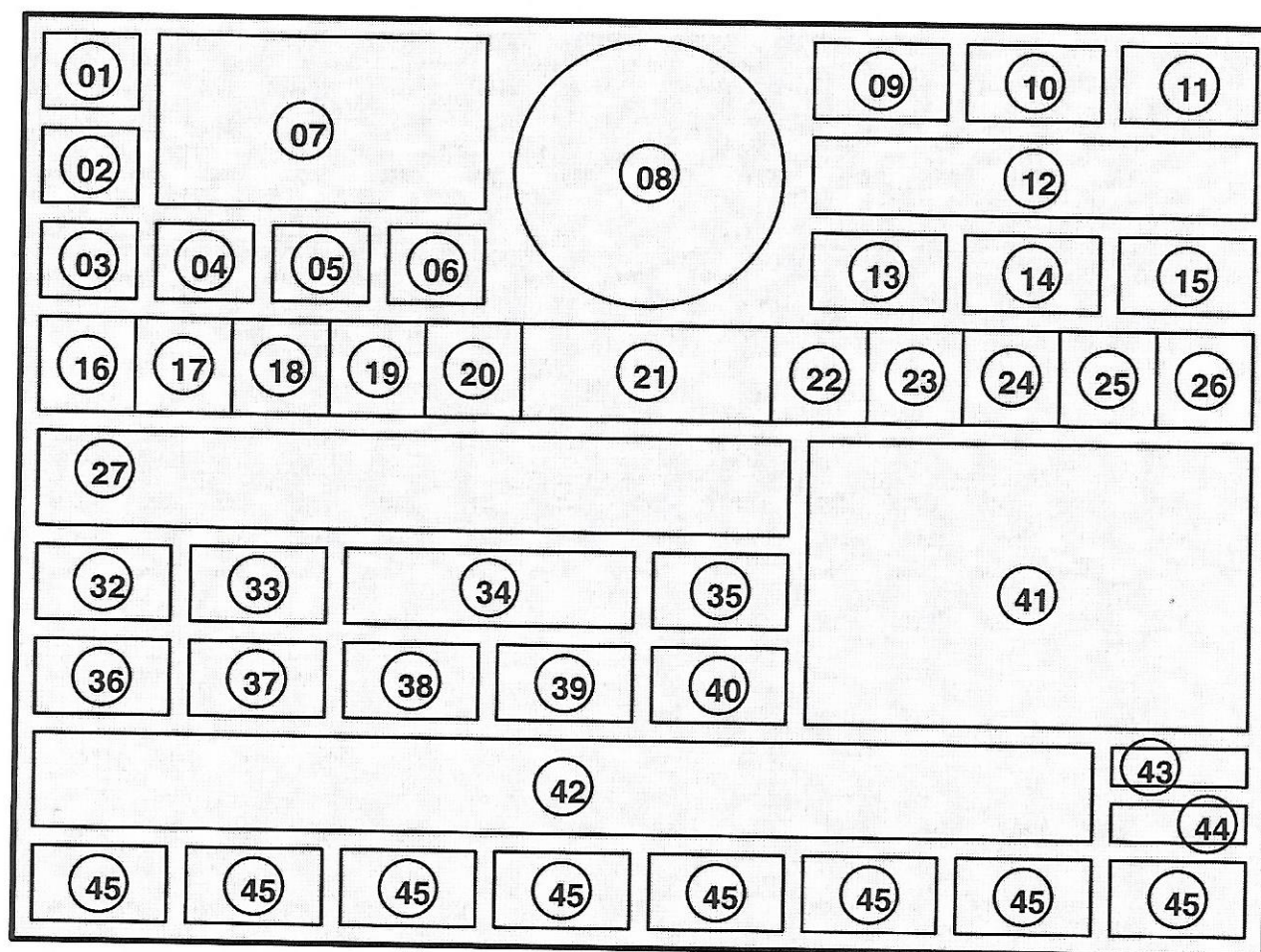


FIG. 4. SAMPLE OPERATION SCREEN. E-43314.

4. **MAIN** – indicates Main Reservoir pressure. The border and the digital number turn red at pressures below the feed valve pressure + 15 psi. The range for this digital marker is 0–200 psi. A digital reading of “***” indicates an out-of-range value from the corresponding transducer or that EAB is not communicating with IFC.
5. **REAR** – indicates trainline pressure for the last car if the End-Of-Train (EOT) device is installed. The border and digital number turn red at pressures below 45 psi. The range for this digital marker is 0–200 psi. If “EOT COMM” alarm is active, or if communication between IFC and EOT is broken, or if EOT is turned OFF, the number will read “***”.
6. **FLOW** – indicates air flow in the Brake Pipe. The range for this digital marker is 0–200 cfm. A digital reading of “***” indicates an out-of-range value from the corresponding transducer or that EAB is not communicating with IFC.
7. **Air Gage Bar Graphs** – The ER and BP pressures are also shown in bar graph form. Range (full scale) is 40–120 psi for the bar graphs. Bar color is blue. The blue pointer indicates Feed Valve Setting.
8. **Speedometer** – The digital portion of the speedometer registers locomotive speed in MPH with an alarm mode set above 70 MPH (independent of track maximum set speed) – graphic turns yellow in alarm mode. The digital portion is displayed in two scales – LO scale which reads from 0 to 9.9 mph in 0.1 mph segments and HI scale which reads from 10 – 199 mph in 1 mph segments. The



REF.	DESCRIPTION	REF.	DESCRIPTION
1	EQUALIZING RESERVOIR PRESSURE (ER)	21	ALERTER ALARM (ALERTER)
2	BRAKE PIPE PRESSURE (BP)	22	NOT USED
3	BRAKE CYLINDER PRESSURE (BC)	23	EOT COMMUNICATION LOSS ALARM (EOT COMM)
4	MAIN RESERVOIR PRESSURE (MAIN)	24	NOT USED
5	LAST CAR PRESSURE (REAR)	25	EOT BATTERY ALARM (EOT BATT)
6	AIR FLOW GAGE (FLOW)	26	EOT MOTION MARKER (EOT MOVE)
7	AIR PRESSURE (ER AND BP) BAR GRAPH	27	AIR BRAKE MESSAGE WINDOW*
8	LOCOMOTIVE SPEEDOMETER (GRAPHIC AND DIGITAL)	32	NOT USED
9	DISTANCE COUNTER	33	PWR REDN %
10	NOT USED	34	NOT USED
11	ROAD NUMBER	35	POWER REDUCTION/AUTOMATIC SPEED CONTROL
12	LOAD METER BAR GRAPH (BRAKE AND MOTOR)	36	INDEPENDENT BRAKE STATUS
13	REVERSE HANDLE POSITION	37	AUTOMATIC BRAKE STATUS
14	TRACTIVE EFFORT/LOAD METER (AMPS)	38	EOT ID CODE
15	THROTTLE OR BRAKE HANDLE POSITION	39	EOT LANTERN MARKER STATUS
16	WHEELSLIP ALARM (WHEEL SLIP)	40	FUEL LEVEL GAGE
17	PCS OPEN ALARM (PCS OPEN)	41	ATCS STATUS (RESERVED)
18	SAND ALARM (SAND)	42	OPERATOR MESSAGE WINDOW
19	DYNAMIC BRAKE ALARM (DYN BRAKE)	43	OPERATION SCREEN LEVEL INDICATOR
20	PENALTY BRAKE ALARM (PENALTY BRAKE)	44	OPERATION SCREEN NUMBER
*ALSO OCCUPIES SPACE FOR ITEMS 28-31, STATUS MARKERS		45	MENU SOFT KEYS**
**SEE APPROPRIATE SECTION OF THIS MANUAL FOR KEY DESIGNATIONS AND LABELS.			

FIG. 5. SAMPLE OPERATION SCREEN INFORMATIONAL AREAS. E-43315.

analog portion of the speedometer registers as a graphic with a scale of 0–80 MPH. The PREDICTOR (yellow circle in rim) indicates the “predicted” speed 60 seconds from present based on the computed acceleration rate. Numbers will turn yellow in alarm mode.

NOTE: *When locomotive speed is increasing from zero, the digital readout scale will change from LO to HI at 10 mph. When locomotive speed is decreasing from 70 mph, the digital readout scale will change from HI to LO at 8 mph.*

9. **DISTANCE** – The distance counter displays the distance traveled in feet (up to 99,999 feet) based on the input from the number two motor tachometer. The counting is bi-directional (counts up when moving forward; back when in reverse) except when passing through zero where it starts counting up again. Use the soft keys (COUNT UP, COUNT DOWN, ZERO COUNTER) to control counter operation from Screen 310 000.

10. **Not Used.**

11. **ROAD NO** – The locomotive road number is displayed in this position. Number range is from 0 to 9999. If the road number was not entered or is unknown or a loss of communication, a “****” will be displayed.

12. **Load Meter Bar Graph** – This graph shows the average braking or motoring current (Amps) from all cut-in traction motors. **In Motoring**, the bar (from 0 to 1800 Amps) is green. **In Braking**, the bar (from 0 to 1200 Amps) is yellow. This bar also turns yellow at Dynamic Brake setup.

NOTE: *The Load Meter Bar Graph should show “0” during Self Load.*

13. **REVERSE** – This status marker indicates whether the **Reverse** Handle is in “Fwd”, “Off” or “Rev” position.
14. **AMPS** – This status marker indicates digitally what the **Load Meter Bar Graph** (12), located directly above, is displaying. The range is from 0 to 1800 Amps with motoring in green and 0 to 1200 Amps with braking in yellow.

15. **THROTTLE/BRAKE** – This status marker indicates the current position of the **Throttle** or **Braking** Handle. In motoring the green indications can be: “Off”, “Idle” or “N1” through “N8”. In braking the yellow indications can be: “Off”, “Set-Up” or “B1” through “B8”.

16. **WHEEL SLIP** – This white marker light indicates that the wheels on some locomotives in the consist are slipping or sliding. This is a trainlined indication.

17. **PCS OPEN** – This white marker light indicates a Penalty or Emergency air brake application has occurred. Power has been eliminated. Engine speed remains at IDLE. See Railroad Operating Rules for specific application.

18. **SAND** – This white marker light indicates that sanding is taking place either manually or automatically as a result of wheelslip. During a wheelslip, sanding and the SAND light will automatically turn on, then off.

19. **DYN BRAKE** – This flashing yellow marker light indicates that a locomotive in the consist is experiencing excessive dynamic braking current. Reduce the **Braking** Handle position until this light goes out.

20. **PENALTY BRAKE** – This flashing yellow marker light indicates that the locomotive is in a penalty brake situation.

21. **ALERter** – This area counts down to an Alerter Penalty Brake. In Penalty Brake situations, the square will flash red and the alarm will sound until reset occurs or a penalty brake application occurs.

NOTE: *The Alerter system will flash red and count down from 25 if proper operator response has not been detected. See ALARMS, SAFEGUARDS, POWER DERATIONS AND SHUT-DOWNS Section of this manual for further information.*

22. **Not Used.**

23. **EOT COMM** – This marker light indicates component problems with the End of Train (EOT) device. EOT COMM will light yellow when communication with EOT transmitter is broken. The computer will also order the Audio Visual Alarm Box (AVB) to

beep. Value for **LC (5)** will be *** if **EOT COMM** alarm is active. *See Railroad Regulations for appropriate action.*

24. Not Used.

25. EOT BATT – This marker light indicates component problems with the End of Train (EOT) device. EOT BATT will light yellow when the EOT battery is weak and light red when dead. *See Railroad Regulations for appropriate action.*

26. EOT MOVE – This status marker indicates movement status of the EOT Device. Possible indications are: "Move" and "Stop".

27. Air Brake Message Window (occupies space for status markers 28–31) – The yellow worded messages (possible two lines) inform the operator of the Electronic Air Brake system status. See **Air Brake** operation section of this document.

32. Not Used.

33. PWR REDN % – This status marker is yellow when the function is active. The program gives the operator computer controlled power for slow speed loading/unloading and hump control type operations. The range of this manual speed reduction function is 0–100 % in 5% increments per each notch selected (Notch 1 through 8) and can be used up to 10 mph.

34. Not Used.

35. Manual Power Reduction/Automatic Speed Control – This status marker is yellow when the function is active. This feature gives the operator computer controlled speed for slow speed loading/unloading similar to pacesetter type control. The speed can be changed in 0.1 mph increments starting from 0.0 mph (0.1 and 0.2 not available) up to and including 10.0 mph.

36. IND BRK – This white status marker indicates whether the Independent Brake Handle is in "Lead" or "Trail" position. When in "Trail", the marker is yellow.

37. AUTO BRK – This white status marker indicates whether the Automatic Brake Handle is in "Cut In" or "Cut Out" position. When in "Cut Out", the marker is yellow.

38. EOT ID – This white status marker lists the End Of Train Identification Code. The range is from 00000 to 99999. A "****" will be displayed for an out-of-range or unknown value or loss of communication. A yellow TEST CODE will be displayed as an alarm condition.

39. EOT MKR – This white status marker indicates the EOT Lantern Marker status. Possible indications are "ON" and "OFF". When in "OFF", the status marker is yellow. A "****" will be displayed for an out-of-range or unknown value or loss of communication.

40. FUEL – This white status marker indicates how much usable fuel is remaining in the fuel tank. The range is 0 to 9999 gallons. When the remaining fuel drops below 500 gallons, the status marker will turn yellow.

41. ATCS System – This area is reserved for the ATCS System indicators.

42. Operator Message Window – This area will display Summary and Fault Messages from the IFC system. Usually a white status indicator, this area will turn yellow whenever there is a new message or active alarm.

43. Operation Screen Level Indicator – This white status marker indicates what level of operation the displayed screen permits. Possible levels are "L1", "L2", "L2S", "L3" and "L4". Levels L3 and L4 will be displayed in yellow and are not covered in this manual.

NOTE: *Several levels of information access are available through the IFD screens. Only L1 Operation of the screens is discussed in this publication.*

44. Operator Screen Number – This white status marker indicates what Operation Screen is being displayed. The number is used for operator assistance while operating the IFDs and is listed in this manual as reference points.

45. Menu Soft Keys – Below the Operator Message Window is a keypad with eight keys. Some keys on the key pad are restricted and used on specific occasions, primarily for L2 maintenance operations. Menu information only appears over active keys. See appropriate sections of this manual for key designations and labels.

NOTE: Numbers in parentheses () refer to items found on Figure 3 of this publication unless noted otherwise.

Circuit Breakers

The following circuit breakers are located on the control stand:

1. **Engine Run Circuit Breaker** – This breaker (11) controls engine speed. Breaker must be ON on the lead unit and OFF on others in the consist to control engine speed through the throttle speed and engine run trainlines. When this breaker is tripped, the engine will not power above Notch 1.
2. **Generator Field Circuit Breaker** – This breaker (12) is ON whenever the locomotive is powered and operating as a Lead unit. The breaker may be turned OFF to keep the main generator de-energized when it is necessary to run the engine at speeds higher than IDLE. On Trail locomotives, it should be in the OFF position.
3. **Control Circuit Breaker** – This breaker (13) provides power to the trainline control positive wire (T/L 13) and other circuits, including the alarm bell. In MU operation, this breaker must be ON on the Lead unit only.
4. **Dynamic Braking Control Breaker** – This breaker (14) is used to control the dynamic braking of the locomotive. In MU operation, this breaker must be ON on the Lead unit only to control the dynamic braking of other units in the consist.

Gage Light Dimmer Knob

The dimmer (1) knob is used to brighten and dim the control stand gage lights.

Forward Headlight Switch

This switch (16) controls the operation of the short-hood headlight. The switch has three positions; OFF, DIM and BRIGHT.

Spotter Receptacle

This receptacle (17) has been provided for use of a Spotter Button.

Cab Signal Acknowledge Pushbutton

This pushbutton (19) is used to verify operator alertness and to acknowledge downward signal aspect changes of the Cab Signal System.

Trainline Ground Reset Toggle Switch

This spring-loaded toggle switch (20) resets the Ground Relay on locomotives which are equipped for trainline ground reset.

17KC108 Master Controller

The 17KC108 Master Controller (Item 21, Fig. 3) is a three-handle, manually operated, set-up switch used by the engineer to regulate locomotive power, dynamic braking and direction. The three handles are the **Throttle**, the **Braking** and the **Reverse**, and their functions are as follows:

1. The **Throttle** handle is above the **Reverse** handle. It has a SHUTDOWN, IDLE and eight major positions or notches for power.

The SHUTDOWN position is located to the right of IDLE and is used in an emergency to shutdown all engines of a multiple-unit consist from the operator's position of the controlling unit. Pull out axially on **Throttle** handle to put into SHUTDOWN.

To increase motoring power, the handle is moved clockwise toward the operator.

2. The **Reverse** handle, the bottom of three handles, is used to determine the direction of locomotive travel. It has positions REVERSE, OFF and FORWARD. The handle is removable only when the **Throttle** handle is in IDLE position and **Braking** handle is in OFF.
3. The **Braking** handle is above the **Throttle** handle and has OFF and SET-UP positions and a BRAKING sector.

In the OFF position, nearest the operator, dynamic braking is shut off. The SET-UP position establishes dynamic braking circuits. Movement beyond this position into the BRAKING sector (counterclockwise away from the operator) increases effort.

Interlocking Between Handles

Interlocking between the handles of the Master Controller is provided as follows:

1. The **Reverse** handle must be inserted before the **Throttle** handle can be moved out of IDLE position.
2. The **Reverse** handle can be moved into FORWARD or REVERSE only when the **Throttle** handle is in IDLE position and the **Braking** handle is in OFF position.
3. The **Reverse** handle cannot be moved out of FORWARD or REVERSE position when the **Throttle** handle is advanced beyond IDLE or the **Braking** handle is advanced beyond OFF.
4. The **Braking** handle must be in OFF position before the **Throttle** handle can be moved out of IDLE position.
5. The **Throttle** handle must be in IDLE and the **Reverse** handle in FORWARD or REVERSE before the **Braking** handle can be moved.
6. The **Reverse** handle can be removed when the **Braking** handle is in OFF and the **Throttle** handle is in IDLE.

Operation

To manipulate the controller operating handles during locomotive operation, proceed as follows:

LEAD OR SINGLE-UNIT OPERATION

Operating handle set-up (**Reverse** handle removed):

1. **Braking** (top) handle in OFF.
2. **Throttle** (middle) handle in IDLE.

WARNING: Finding the **Braking** handle away from OFF or the **Throttle** handle away from IDLE with the **Reverse** handle removed indicates that interlocking between handles requires repair or adjustment. Do not attempt to operate unit until condition has been repaired.

3. Insert the **Reverse** (bottom) handle.
4. Set the **Reverse** handle for desired direction.

OPERATION IN POWER MODE

1. **Braking** handle remains in OFF.
2. Move the **Throttle** handle to the desired notch.

OPERATION IN DYNAMIC BRAKE MODE

1. **Throttle** handle returned to IDLE.
2. Move the **Braking** handle to SET-UP; pause for several seconds; then advance as desired.

OPERATION AS TRAIL UNIT

WARNING: To ensure safe consist operation, follow specific Railroad precautions for setting-up units for "Trail" or "Dead".

1. **Braking** handle in OFF
2. **Throttle** handle in IDLE.
3. **Reverse** handle centered and removed.

NOTE: Numbers in parentheses () refer to items found on Figure 3 of this publication unless noted otherwise.

Rear Headlight Switch

This switch (22) controls the operation of the long-hood headlight. The switch has three positions; OFF, DIM and BRIGHT.

Bell Switch (Fig. 3)

Engaging the Bell Switch (28) starts the locomotive bell (Item 30, Fig. 2) to ring. Pressing the Bell Switch again will silence the bell. The locomotive bell is interlocked with the horn so that the bell will ring when the horn sounds. It is necessary to depress and release the Bell Switch to silence the bell when it has been energized by the Horn Interlock.

Crossing Lights Selector Switch

This switch (25) controls the operation of the Road Crossing (Ditch) lights and has two positions; SHORT HOOD and LONG HOOD.

Independent Brake Handle

See AIR BRAKE EQUIPMENT Section of this publication for the description of this handle (27).

Sand Switch

Moving this switch (29) applies sand to the rail in front of the leading axle of each truck when locomotive speed

is less than 12 mph. Above 12 mph, manual sanding is not available. Lead axle sand will still function normally.

Automatic Brake Handle

See **AIR BRAKE EQUIPMENT** Section of this publication for the description of this handle (30).

Lead Axle Sand Switch

Moving this switch (31) applies sand to the rail in front of the leading axle, depending on locomotive direction, regardless of speed.

DEVICES ON ENGINE CONTROL PANEL

NOTE: Numbers in parentheses () refer to items found on Figure 6 of this publication unless noted otherwise.

The Engine Control (EC) panel is located on the long-hood wall of the operator's cab. Mounted on this panel are various switches, circuit breakers and operating devices used during locomotive operation.

Top Row of Circuit Breakers

The top row circuit breakers (4–8) on the EC panel are used for equipment that can be turned OFF when the unit is operating as a Trail unit. Circuit breakers 1 and 2 are to be ON when this locomotive is operating in Distributed Power. Circuit breaker 3 must be ON for either Lead or Trail operation.

Second Row of Circuit Breakers

The second row of circuit breakers (10–18) on the EC panel are used for equipment, **ALL OF WHICH MUST BE LEFT ON** whenever the unit is operating as a Lead or Trail unit.

Engine Stop Pushbutton

To shut down the engine, press the Engine Stop pushbutton (9).

Diagnostic Display Panel (DID)

See **DIAGNOSTIC DISPLAY PANEL** Section of this manual for description of this item (19).

Engine Control Switch

The Engine Control (EC) switch (20) has four positions:

1. **START** – The Engine Start switch, see Engine Start Station, is effective only when the EC switch is in **START**. When the engine is running and the EC switch is in **START** position, engine speed is held at **IDLE** and power cannot be applied to the locomotive. The power plant is said to be “off the line.” An alarm bell can be silenced by placing the EC switch in the **START** position.
2. **ISOLATE** – When the engine is running and the EC switch is in the **ISOLATE** position, the engine speed is held at **IDLE** and power cannot be applied to the locomotive. The message “**ISOLATED**” will appear on the Diagnostic Display Panel. The alarm bell will sound if a fault occurs that will shut down the engine.
3. **RUN** – When the engine is idling and the locomotive is to be operated, the Engine Control (EC) switch must be moved to the **RUN** position.

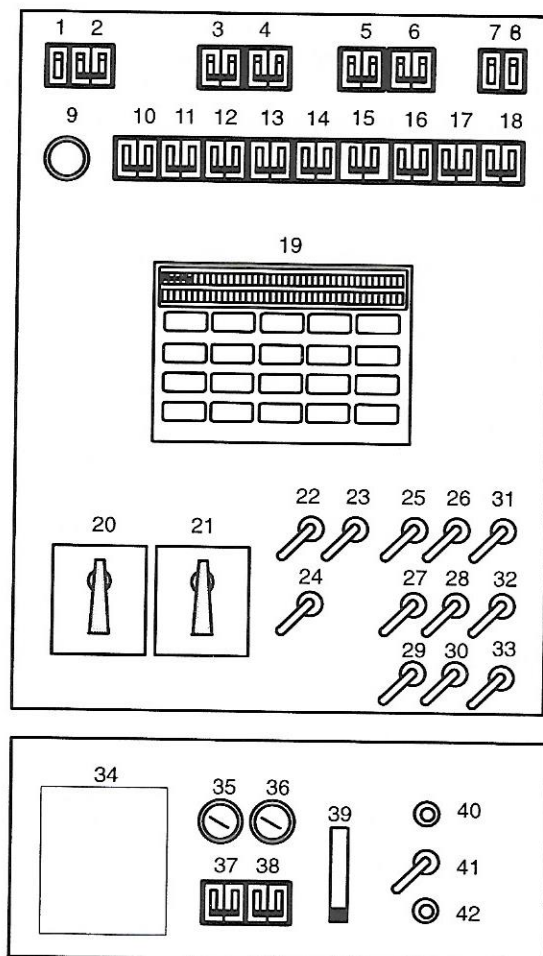
NOTE: If the EC switch is left in the RUN or ISOLATE position when the diesel engine is shut down, the alarm bell will sound continuously.

4. **JOG** – When the engine is shutdown and the locomotive is to be moved using battery power, the EC switch is moved to the **JOG** position.

MU Headlight Set-Up Switch

The MU Headlight Set-Up switch (21) has five positions. Positioning of this switch is determined by location of the locomotive unit in the consist and whether the short hood of the locomotive unit is leading or trailing. Switch positions are as follows:

1. **SINGLE OR MIDDLE UNIT** – Place switch in this position on any locomotive unit operated singly or on all units, except the Leading or Trailing unit, when the locomotive consist is made up of more than one unit.
2. **SHORT-HOOD LEAD – LEADING UNIT** – Place switch in this position when the Leading unit is operated with the short hood forward.
3. **LONG-HOOD LEAD – LEADING UNIT** – Place switch in this position when the Leading unit is operated with the long hood forward.



REF.	DESCRIPTION
1	TRAINLINE POWER (DPC) CIRCUIT BREAKER (30 A)
2	RADIO MODULE (DPC) CIRCUIT BREAKER (10 A)
3	LEB COMPUTER CIRCUIT BREAKER (10 A)
4	CAB SIGNAL CIRCUIT BREAKER
5	ROAD CROSSING LIGHTS CIRCUIT BREAKER (30 A)
6	RADIO CIRCUIT BREAKER (10 A)
7	SHORT-HOOD HEADLIGHT CIRCUIT BREAKER (15 A)
8	LONG-HOOD HEADLIGHT CIRCUIT BREAKER (15 A)
9	ENGINE STOP PUSHBUTTON
10	AIR BRAKE COMPUTER CIRCUIT BREAKER (10 A)
11	TOILET TANK HEATER CIRCUIT BREAKER (10 A)
12	FUEL MONITOR CIRCUIT BREAKER (5 A)
13	AIR DRYER CIRCUIT BREAKER (5 A)
14	RUNNING LIGHTS CIRCUIT BREAKER (ALL LIGHTS EXCEPT HEADLIGHTS; 30 A)
15	ELECTRIC PARKING BRAKE CIRCUIT BREAKER (5 A)
16	FUEL PUMP CIRCUIT BREAKER (15 A)
17	LOCAL CONTROL CIRCUIT BREAKER (30 A)
18	BATTERY CHARGE AND COMPUTER CIRCUIT BREAKER (10 A)
19	DIAGNOSTIC DISPLAY PANEL (DID)
20	ENGINE CONTROL SWITCH
21	MU HEADLIGHT SET-UP SWITCH
22	CROSSWALK LIGHTS SWITCH
23	CONTROL COMPARTMENT LIGHT SWITCH
24	SHORT-HOOD NUMBER LIGHTS SWITCH
25	NO. 1 MOTOR CUT-OUT
26	NO. 2 MOTOR CUT-OUT
27	NO. 3 MOTOR CUT-OUT
28	NO. 4 MOTOR CUT-OUT
29	NO. 5 MOTOR CUT-OUT
30	NO. 6 MOTOR CUT-OUT
31	SPEED SENSOR CUT-OUT SWITCH
32	LOCKED AXLE CUT-OUT SWITCH
33	DYNAMIC BRAKE CUT-OUT SWITCH
34	SUPPLEMENTAL SPEED INDICATOR, PULSE
35	ENGINEER STRIP HEATER OUTPUT CONTROL
36	CREW MEMBER STRIP HEATER OUTPUT CONTROL
37	ENGINEER STRIP HEATER CIRCUIT BREAKER (20 A)
38	CREW MEMBER STRIP HEATER CIRCUIT BREAKER (20 A)
39	CAB HEATER/AIR CONDITIONER CIRCUIT BREAKER (200 A)
40	PARKING BRAKE APPLIED INDICATOR LIGHT
41	ELECTRIC PARKING BRAKE SWITCH
42	PARKING BRAKE RELEASED INDICATOR LIGHT

FIG. 6. ENGINE CONTROL PANEL. E-43316.

4. SHORT-HOOD TRAIL – TRAILING UNIT – Place switch in this position when the final Trailing unit is connected so its short hood trails.
5. LONG-HOOD TRAIL – TRAILING UNIT – Place switch in this position when the final Trailing locomotive is connected so its long hood trails.

Crosswalk Lights Switch

This switch (22) operates the crosswalk lights at the front and rear of the locomotive.

Control Compartment Light Switch

This switch (23) turns on lights in Control Areas 1, 2, 3, 4 and 7.

Short-Hood Number Light Switch

This switch (24) operates short-hood number lights.

Traction Motor Cut-Out Switches – Pull to Throw

The Motor Cut-Out switches (25–30) can be used to cut-out one or more traction motors. At the same time, power output of the locomotive may be reduced. See **ALARMS, SAFEGUARDS, POWER DERATIONS AND SHUTDOWNS** Section of this publication.

CAUTION: *It is recommended that these switches be operated only with the Engine Control switch in START or ISOLATE position so the unit is isolated and the Throttle handle in IDLE. Dynamic Brake operation could be affected.*

Under emergency conditions, the locomotive may be operated for a short period of time with one or more motors cut-out. Refer to Railroad Rules for specific details of operation.

Speed Sensor Cut-Out Switch

This switch (31) cuts out the Speed Sensor signal on all traction motors that are cut-out. This switch is only to be used to cut out faulty sensors; however, ensure that the sensor is at fault and not that it is indicating a locked axle or excessive wheel slip, etc. The sensor will only be cut out (even if switch has been thrown) if the motor cut-out switch has been thrown. Wheel slip and Locked Axle Protection are lost only for the motor that is cut out.

NOTE: *A minimum of two motor speed sensors must be operating for the unit to load.*

Locked Axle Cut-Out Switch

This switch (32) cuts out the Locked Axle Alarm. Before silencing the alarm using this switch, ensure the wheels are rolling. Follow Railroad Regulations governing use of this switch.

Dynamic Brake Cut-Out Switch

This switch (33) cuts out Dynamic Brake and has three positions: CUT IN, CUT OUT – DEFECTIVE and CUT OUT TO COMPLY WITH BRAKING EFFORT RESTRICTIONS. With this switch in either CUT OUT position, upon dynamic brake request, control will not permit unit to go into Dynamic Brake – unit will go to IDLE. Follow Railroad Regulations governing use of this switch.

Speed Indicator

A Pulse solid-state Speed Indicator (34) digitally indicates locomotive speed in miles-per-hour (from IFC system). Speed Indicator is provided for long-hood lead operation.

Strip Heater Circuit Breakers and Output Controls

The circuit breakers will cut-out the Engineer's (37) and Crew Member's (38) strip heaters if tripped. The output control switches (35 and 36) have three positions: OFF, MEDIUM and HIGH.

Cab Heater/Air Conditioner Circuit Breaker

This circuit breaker (39) will cut out the cab heater/air conditioner unit.

Electric Parking Brake Circuit Breaker and Controls

This circuit breaker (15) will cut out the electric parking brake controls. The electric parking brake control switch (41) must be pulled out to move past center and is used to apply or release the electric parking brake. The indicator lights (40 and 42) illuminate to indicate when the brake is Applied or Released.

DEVICES ON THE OVERHEAD CONSOLE

NOTE: *Numbers in parentheses () refer to items found on Figure 7 of this publication unless noted otherwise.*

Crew Member's Desk Light

On the bottom side of the Overhead console is a light (3) for illumination of the desk area. A Switch (2) turns the light on, a dimmer (1) is provided to control the brightness of the light.

Speed Indicator

A Pulse solid-state Speed Indicator (4) digitally indicates locomotive speed in miles-per-hour (from IFC system). Speed Indicator is provided for viewing by crew members in short-hood operation.

Alerter Box And Alarm

The Audio Visual Alarm Box (AVB) is used to alert the operator of various operating alarms (from Alerter, Cab Signal and EOT). The AVB (5) is programmable for audio frequency, tone and volume as well as flashing light patterns of variable intensity.

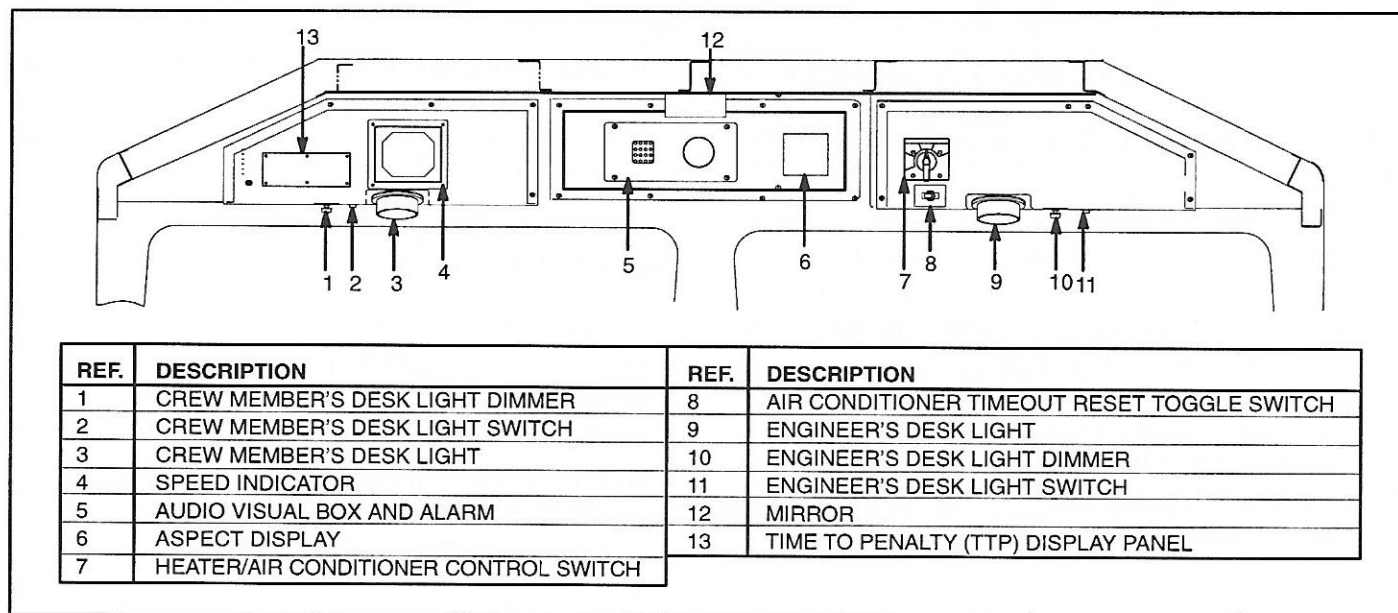


FIG. 7. OVERHEAD CONSOLE. E-43317.

Aspect Display

The Aspect Display (6) allows constant monitoring of aspects not displayed on the IFC.

Air Conditioner And Heater Operation

Air Conditioning

Note the following recommendations and information for better Air Conditioner functioning:

- The air conditioner will cool when Operating Cab temperature is above 70 F (21 C).
- The air conditioner will **not** cool if outside temperature is below 40 F (4 C).
- The air conditioner will maintain a comfortable Cab temperature if cab doors and windows remain closed.
- In very hot weather, on initial cool-down, closing (pull handle OUT) fresh air damper (located on rear wall behind seat) will decrease cool-down time.

Heating

Note the following recommendations and information for better Heater functioning:

- The heater will **not** operate if Operating Cab temperature is above 80 F (26 C).

- Upon start-up, the heater will take 5 to 10 minutes to raise Cab temperature to a comfortable level. To speed this process, turn on (HIGH) the wall strip heaters (Items 35 and 36, Fig. 6) and close (pull handle OUT) outside fresh air damper (located on rear wall behind seat).

Operation

The Air Conditioner and Heater Control Switch (7) has eight positions as follows:

OFF	Shuts off the Air Conditioner and Heater unit.
LOW FAN	Provides air circulation at LOW fan speed.
HIGH FAN	Provides air circulation at HIGH fan speed.
LOW HEAT	Provides low heat at low fan speed.
MED HEAT	Provides medium heat at high fan speed.
HIGH HEAT	Provides maximum heat at high fan speed.
LOW COOL	Provides low cooling air at low fan speed.
HIGH COOL	Provides maximum cooling air at high fan speed.

NOTE: The Heater/Air Conditioner Circuit Breaker (Item 39, Fig. 6) must be ON to operate Air Condi-

tioner and Heater. This breaker must also be ON for the IFD cooling strategy to operate.

Air Conditioner Timeout Reset Toggle Switch

This spring-loaded toggle switch (8) is used to reset the Air Conditioner Automatic Time-out Feature (three-hours).

Engineer's Console Light

On the bottom side of the Overhead console is a light (9) for illumination of the Control Console area. A Switch (11) turns the light on, a dimmer (10) controls the brightness of the light.

Time To Penalty (TTP) Display Panel

This display (13) indicates to the crew member the amount of time until penalty braking will be applied unless proper action is taken.

DEVICES IN CREW MEMBER'S AREA

NOTE: Numbers in parentheses () refer to items found on Figure 8 of this publication unless noted otherwise.

Two-Way Radio Equipment

A radio speaker (1) ties-in with the two-way radio equipment located in the Electronic Equipment Locker and on the Control Stand (Item 2, Fig. 3).

Emergency Brake Valve

The handle of the emergency brake valve (2) is located at the back of the Crew Member's Desk (5). Lifting this handle causes an Emergency brake application.

Toilet Compartment

Refer to Figure 9 for more information on the Toilet Compartment (3).

Ice Chest

An ice chest (4) storage area is supplied in the Crew Member's area facing the stairway into the Nose Cab area.

Crew Member's Strip Heater

Located near the floor of the operating cab is the Crew Member's wall strip heater (7). The heater is controlled by an Output control (OFF/MEDIUM/HIGH) located below the EC Panel.

NOTE: During tunnel operation and for greater utilization of Heater/Air Conditioner, the Outside

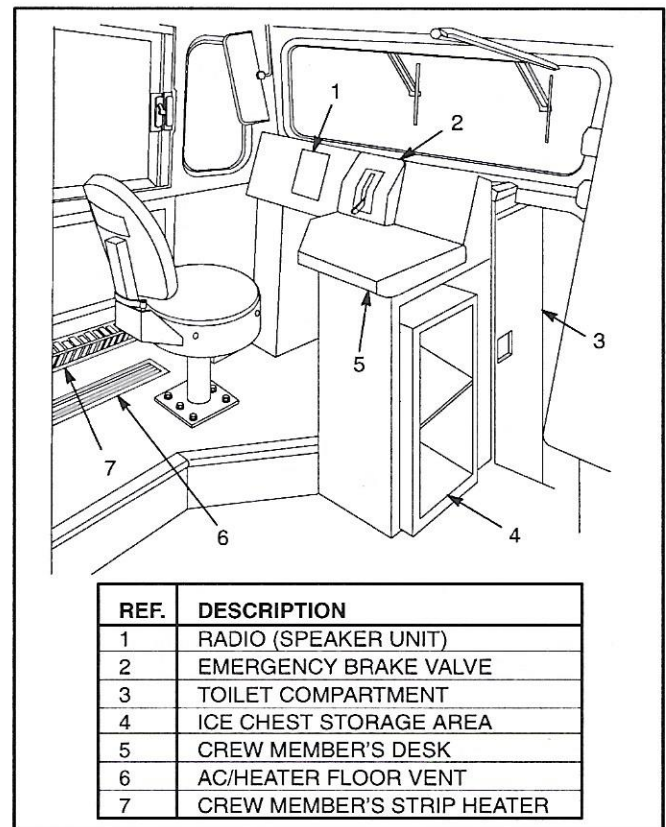


FIG. 8. CREW MEMBER'S AREA. E-43318.

Air Vent Control (located on rear wall behind seat) must be closed (pull handle OUT).

OTHER OPERATOR CAB FEATURES

Cab Dome Light Switch

This switch is located on the back of the Control Stand and turns on the operating cab dome lights.

Nose Cab Light Switch

This switch is located on the back of the Control Stand and turns on the nose cab dome light.

Toilet Room Light Switch

This switch is located on the back of the Control Stand and turns on the toilet compartment dome light.

Toilet Compartment (Fig. 9)

Located in the Nose Cab on the B-side of the locomotive, forward of the Crew Member's area.

Engineer's/Crew Member's Dome Lights and Windshield Wiper Valves (Fig. 10)

Located and controlled above the Engineer's and Crew Member's positions.

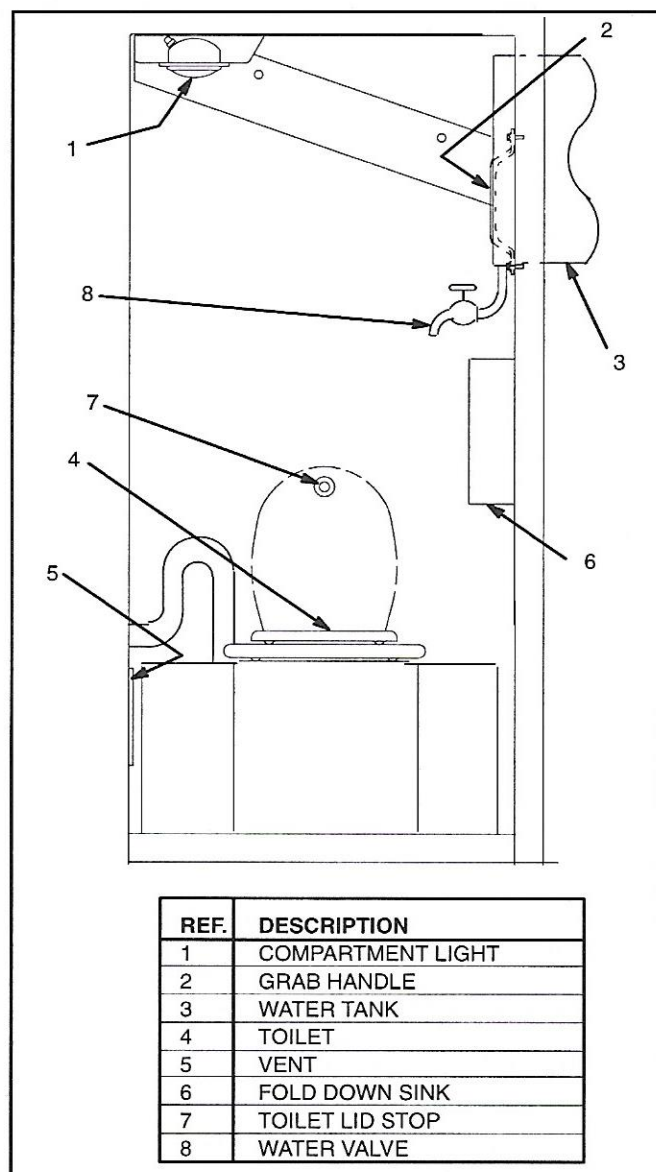


FIG. 9. TYPICAL TOILET COMPARTMENT.
E-43319.

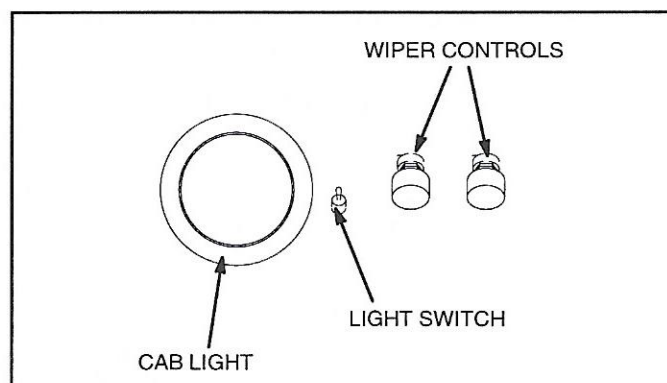


FIG. 10. TYPICAL ENGINEER'S AND CREW
MEMBER'S OVERHEAD DOME LIGHT AND
WIPER CONTROLS. E-42503.

Battery Switch

The Battery Switch is located behind the door in Control Area 1 below the Engine Control panel (see Fig. 18).

DIAGNOSTIC DISPLAY PANEL (DID)

GENERAL INFORMATION

The DID panel is a fast and accurate means of communications between the locomotive operator and computers. The DID panel can be utilized in several ways:

1. If an abnormal operating condition (called a "FAULT") is detected, the computers will initiate the ALARM mode. In the ALARM mode, the computer uses the DID panel to alert the operator to the FAULT by displaying a description of the FAULT and, in some cases, ringing the Alarm bell.

NOTE: All FAULT messages are preceded by a four digit Fault Number beginning with a "4".

2. The FAULT detected may require that certain operating restrictions be imposed on the locomotive as a means of protecting the locomotive's equipment. The locomotive computers impose the necessary restrictions and inform the operator of those restrictions through the DID panel in the form of SUMMARY messages.
3. A SUMMARY message on the display, informs the operator of the general status of the locomotive's operating condition, its computers, restriction placed on the locomotive due to faults and, in some cases, the status of the display itself.

NOTE: A SUMMARY message is not preceded by a number.

4. The FAULT is recorded in a FAULT "Log" for later review by maintenance personnel.
5. The operator can use the DID panel to review active FAULTS and their related restrictions (SUMMARY messages). The DID panel also enables the operator to reset FAULTS, and attempt to return the locomotive to normal operation.

NOTE: In accordance with railroad selected options, in some cases, the ability to reset certain FAULTS has been restricted to maintenance personnel.

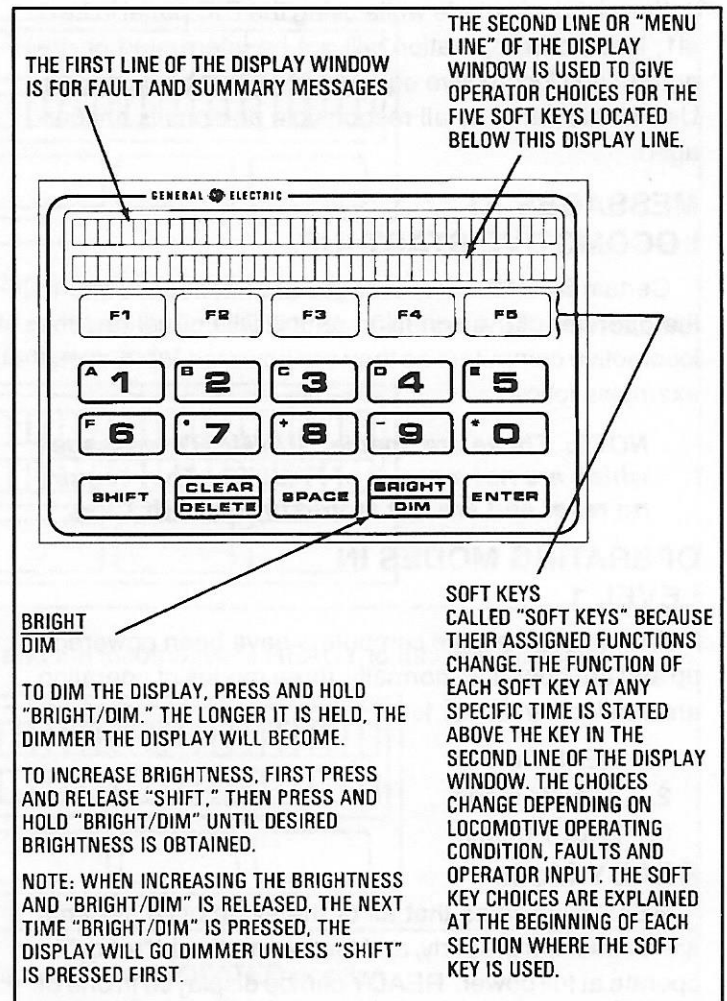


FIG. 11. DIAGNOSTIC DISPLAY PANEL. E-32790A.

THE DISPLAY

Message Windows

The Diagnostic Display (DID) panel has a two-line display window as described in Figure 11.

Keys

Below the two-line display is a keypad with four rows of keys. Figure 11 describes the use of these keys in Level 1. Other keys on the key pad are used on specific occasions, primarily for Level 2 maintenance operations.

NOTE: Several levels of information access are available through the DID panel. Only Level 1

- Several FAULTS may impose the same operating restrictions and will therefore, result in the same SUMMARY message.

NOTE: A SUMMARY message will only be displayed once (by priority) regardless of the number of active FAULTS which generate the same message.

- A FAULT may result in more than one operating restriction and therefore, more than one SUMMARY message.
- Under normal operating conditions, the highest priority SUMMARY message will be displayed. Highest priority being those conditions which have the greatest effect on the locomotive's ability to operate normally.
- A list of SUMMARY messages by priority appears on Page 28.

FAULT Mode Soft Keys

The following soft keys can be used by the operator to view SUMMARY and FAULT messages and to begin and to complete the reset procedure.

Soft Key Label	Explanation
Exit	Takes the DID panel out of the current operating mode.
Reset?	<p>This soft key asks the operator, "Do you want to Reset?" (a FAULT). It can only appear when there are Active FAULTS that can be reset by the locomotive crew.</p> <p>Resetting a FAULT which has imposed operating restrictions is the only way to return the locomotive to the READY condition.</p> <p>Resetting a FAULT requires two steps: Pressing "Reset?" initiates the reset procedure. When "Reset?" is pressed, the most recent FAULT will be displayed with the choice of resetting that FAULT or looking at other FAULTS which have not been reset ("Active" FAULTS).</p> <p>NOTE: "Reset" (without the question mark) must be pressed to complete the reset procedure.</p>
Reset	Pressing this key completes the reset procedure. Pressing "Reset" tells the computer this FAULT has been

corrected, to remove all operating restrictions imposed by it and, if there are no other Active FAULTS, to return the locomotive to normal operation. When all Active FAULTS have been reset, the message "READY - Work Report Stored" will be displayed. If other Active FAULTS remain, the highest priority SUMMARY message will be displayed.

CAUTION: Equipment damage may result - If a FAULT reoccurs soon after being reset, the operator should NOT attempt to reset the FAULT more than THREE TIMES until the cause of the FAULT has been determined and corrected.

NOTE: If a FAULT causes power to be removed, the unit may not load after the FAULT is reset until the call for power is removed and again requested. This is done by momentarily placing the Engine Control (EC) switch in the ISOLATED position.

NOTE: If a FAULT is already Active (not reset), it will not reoccur. If a FAULT is reset and the problem not corrected, the FAULT will reoccur and the ALARM mode will be re-initiated.

Older and Newer
FAULT messages are displayed in order of **most recent** first. The "Older" and "Newer" soft keys allow the operator to view "Older" and "Newer" Active FAULT messages respectively.

ShoMore and GoBack
SUMMARY messages are displayed in order of **highest priority**. "ShoMore" and "GoBack" allow the operator to review ALL SUMMARY messages (operating restrictions). Each time "ShoMore" is pressed, the next lower priority SUMMARY message will be displayed. Pressing "GoBack" will display the next higher priority SUMMARY message.

NOTE: The choices "ShoMore" and "GoBack" are given only when there are lower or higher priority SUMMARY messages respectively.

NOTE: If there is no key pad activity for 15 seconds, the display will change to show the highest priority SUMMARY message.

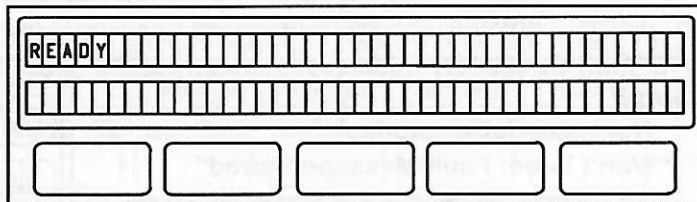
Reset

Press "Reset" to clear the FAULT.

EXAMPLE – LEVEL 1 OPERATION

NOTE: The following example is intended to demonstrate DID operation, rather than show actual locomotive operating circumstances.

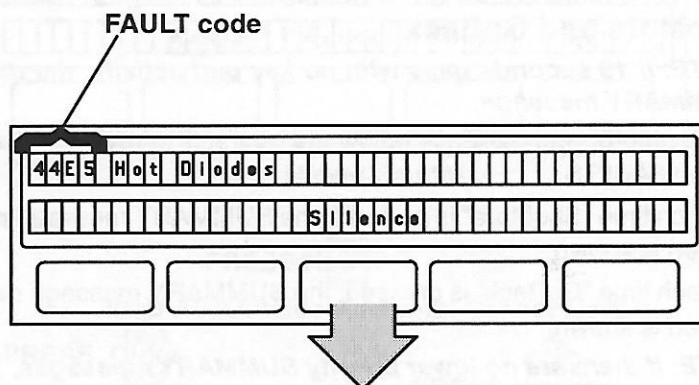
Let us assume, for example, that READY is displayed (the locomotive is in the READY mode).



A hot diode condition in the main rectifiers (a FAULT) is detected and the ALARM mode is initiated.

The display will change to show the FAULT, the word "Silence" will appear, and in this case, the alarm bell will ring.

When "Silence" is pressed OR after 30 seconds pass, the ALARM mode is completed; the bell stops ringing, the word "Silence" disappears and the display changes to show the **highest priority SUMMARY** message.



See FAULT MODE

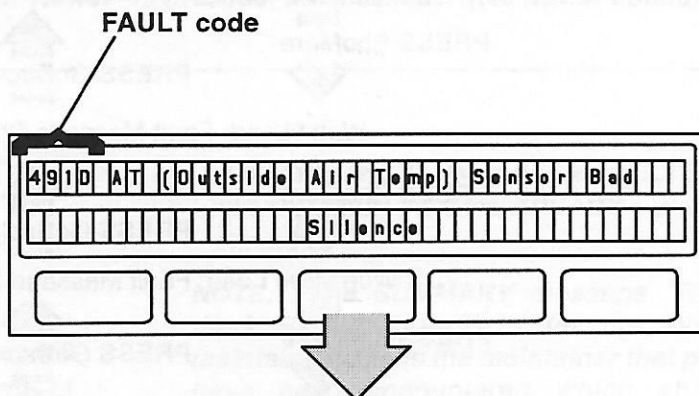
Second Alarm

Next, let us assume that a bad outside air temperature sensor is detected. This FAULT occurred after the hot diode FAULT previously discussed and is therefore, a NEWER FAULT.

The ALARM mode is initiated and the display will change to show the bad temperature sensor FAULT.

NOTE: This FAULT is not accompanied by a bell but "Silence" will appear.

The procedure as previously described will be followed, the ALARM mode will be completed and the highest priority SUMMARY message will be displayed.



See FAULT MODE

FAULT Mode

The highest priority SUMMARY message is now displayed. "Won't Load: Hot Diodes" is the highest priority operating restriction placed on the locomotive as a result of the hot diode FAULT and the "Air Temperature Sensor Bad" FAULTS. The operator now has two choices:

1. Press "Reset?" which will initiate the reset procedure, or
2. Press "ShoMore" to view all operating restrictions placed on the locomotive.

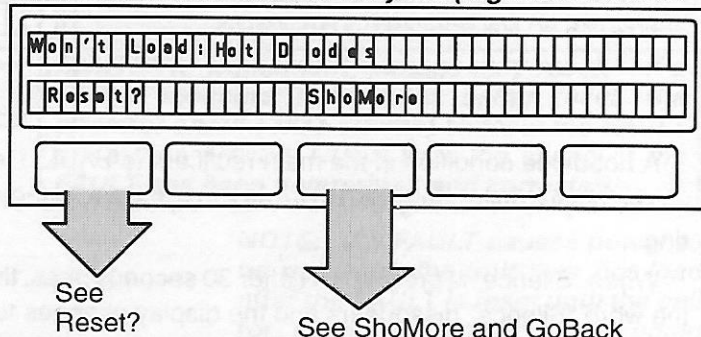
NOTE: Four SUMMARY messages result from the "44E5 Hot Diodes" FAULT. They are (highest to lowest priority):

"Won't Load: Hot Diodes"

"Won't Load: Fault Message Stored"

"No Dynamic Brake: Fault Message Stored."

"Won't Self-Load: Fault Message Stored"



NOTE: If there are no other SUMMARY Messages, "ShoMore" will not appear.

ShoMore and GoBack

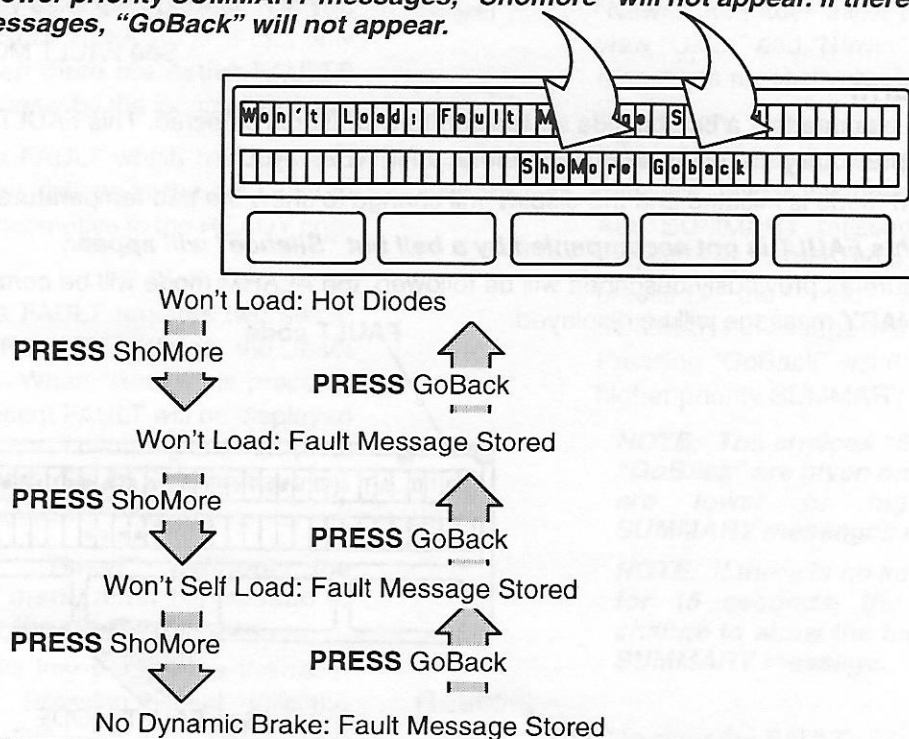
NOTE: If 15 seconds pass with no key pad activity, the display will change to show the highest priority SUMMARY message.

"ShoMore" and "GoBack" allow the operator to review all restrictions placed on the locomotive as a result of Active FAULTS.

Each time "ShoMore" is pressed, the SUMMARY message **next lower** in priority to the message currently displayed is shown.

Each time "GoBack" is pressed, the SUMMARY message **next higher** in priority to the message currently displayed is shown.

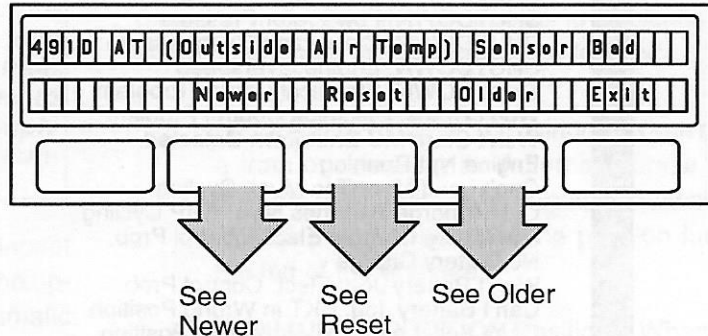
NOTE: If there are no lower priority SUMMARY messages, "Shomore" will not appear. If there are no higher priority SUMMARY messages, "GoBack" will not appear.



Reset?

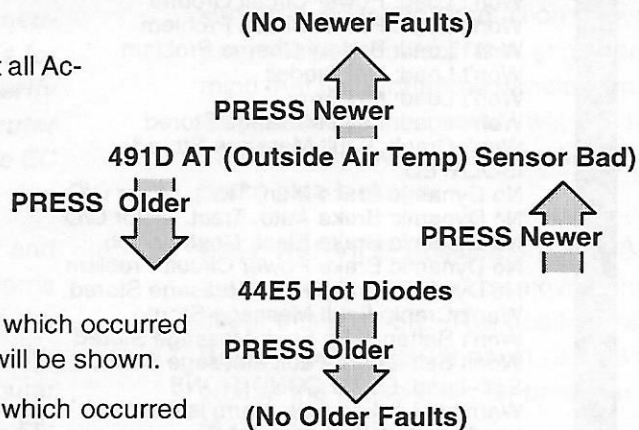
"Reset?" is the first step in the FAULT reset procedure.

When "Reset?" is pressed, the most recent (newest) FAULT message is displayed.



Older or Newer

"Newer" and "Older" allow the operator to look at all Active FAULTS and to select the FAULT to be reset.



Each time "Older" is pressed, the FAULT which occurred previous to the FAULT currently displayed will be shown.

Each time "Newer" is pressed, the FAULT which occurred after the FAULT currently displayed will be shown.

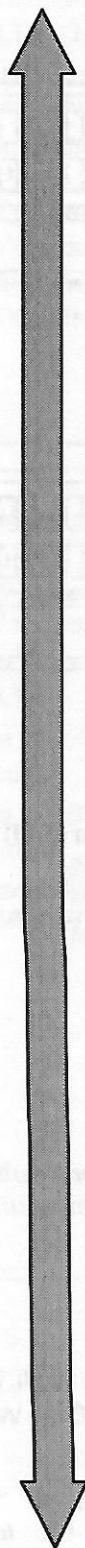
NOTE: If there are no older FAULTS and "Older" is pressed, the message "(No Older Faults)" will appear. If there are no newer FAULTS and "Newer" is pressed, the message "(No Newer Faults)" will appear.

Several things happen when a FAULT is reset:

1. All operating restrictions imposed by the FAULT are removed.
2. If there are other Active FAULTS, the display will show the highest priority SUMMARY message of the remaining Active FAULTS.
3. If there are NO OTHER Active FAULTS, the display will change to show: "READY – Work Report Stored."

NOTE: The SUMMARY message "READY – Work Report Stored" is for the locomotive maintainer. It tells the maintainer that problems have been encountered which should be investigated.

LIST OF SUMMARY MESSAGES

Highest
PriorityLowest
Priority

WAIT
 WARNING! Air Compressor Does Not Pump
 WARNING! AC Exhauster Does Not Pump
 Won't Load: Locked Axle Detected
 SHUTDOWN: Low Water Flow
 SHUTDOWN: Low Lube Oil Pressure
 SHUTDOWN: Low Water Pressure
 SHUTDOWN: Crankcase Overpressure
 SHUTDOWN: Engine Overspeed
 SHUTDOWN: Electrical Control Problem
 Won't Crank: Electrical Control Problem
 Won't Start: MU Shutdown Detected
 Engine Not Running
 Can't Load Now: Too Much Cycling
 Can't Charge Batteries Now: BRP Cycling
 No Battery Charge: Elect. Control Prob.
 No Battery Charge
 Won't Battery Jog: Elect. Control Prob.
 Can't Battery Jog: BKT in Wrong Position
 Can't Self-Load: REV in Wrong Position
 Won't Load: Crankcase Overpressure
 Won't Load: Low Lube Oil Pressure
 Won't Load: Low Water Pressure
 Won't Load: Overspeed Governor Problem
 Won't Load: Aux. Alternator Field C/O
 Won't Load: Side Door Open
 Won't Load: Electrical Control Problem
 Won't Load: Too Many Speed Sensors C/O
 Won't Load: Waiting for Aux. Alternator
 Won't Load: Hot Engine
 Won't Load: Power Circuit Ground
 Won't Load: Power Circuit Problem
 Won't Load: Battery Charge Problem
 Won't Load: Hot Diodes
 Won't Load: MU Error
 Won't Load: Fault Message Stored
 Won't Crank: Fault Message Stored
 ISOLATED
 No Dynamic Brake Man. Tract. Motor C/O
 No Dynamic Brake Auto. Tract. Motor C/O
 No Dynamic Brake Elect. Control Prob.
 No Dynamic Brake Power Circuit Problem
 No Dynamic Brake Fault Message Stored
 Won't Crank: Fault Message Stored
 Won't Battery Jog: Fault Message Stored
 Won't Self-Load: Fault Message Stored
 Self-Load: LOAD CONDITIONS
 Warning: Locked Axle Alarm is Cut Out
 Load Limited: PLS in Notch 7
 Load Limited: T/L 13 or T/L 16 Open
 Load Limited: Low Lube Oil Pressure
 Load Limited: Low Water Pressure
 Load Limited: Hot Diesel Engine Exhaust
 Load Limited: Hot Engine
 Load Limited: Cold Engine
 Load Limited: Dirty Engine Air Filter
 Load Limited: Traction Motors Cut Out
 Load Limited: Trac. Motor Temp. Protection
 Load Limited: Due To Traction Alternator
 Load Limited: Power Circuit Ground
 Load Limited: Electrical Control Problem
 May Reduce Load: Radiator Fan Cycling
 May Reduce Load: Radiator Fan Problem
 Please Initialize CAB Via Toolbox
 Alarm From Other Unit
 Fault Log is Almost Full
 READY - Fault Message Stored
 READY - Work Report Stored
 READY

AIR BRAKE EQUIPMENT

ELECTRONIC AIR BRAKE SYSTEM

WARNING: STOPPING HAZARD. Under no circumstances should a train be permitted to continue in operation if the brake pipe air pressure falls below 45 psi. If this situation occurs, the train must be stopped and the brake pipe recharged to the railroad particular setting. Failure to comply with this warning may result in the inability to control or stop the train.

As a continuation of the Integrated Function concept to localize most of the control operation in front of the operator and to eliminate (as much as possible) pneumatic devices in the cab area, the electronic air brake control system has been developed and supplied on this unit. It is a microcomputer controlled system replacing pneumatic system valves and relays with electronic controls also located in the air brake rack. See **Operating Procedures** section of this publication for more information.

NOTE: The GE Harris CCBII is an Electro-pneumatic system; that means the system needs locomotive battery power to function. Also, verify that the LEB Computer and Air Brake Computer circuit breakers (Items 3 and 10, Fig. 6) on the EC panel are properly positioned.

The elimination of much of the air brake control and pneumatic devices (through the use of the GE Harris CCBII microprocessor air brake controller) reduces the air connections increasing reliability while also simplifying unit troubleshooting. The Brake Control Computer and associated control devices (e.g., Transducers, Filter, etc.) are located in the GE Harris CCBII ELECTRO PNEUMATIC CONTROL UNIT (EPCU) found in the air brake compartment (Item 4, Fig. 14).

The GE Harris CCBII Microprocessor Air Brake Control System (similar in operation to the Schedule 26-L equipment), arranged for single-end, multiple-unit operation, is used on this locomotive. The principal parts are as follows:

Automatic Brake Handle (Fig. 12)

This brake handle operates through six detented control positions: RELEASE (REL), MINIMUM REDUCTION (MIN), FULL SERVICE (FS), SUPPRESSION

(SUP), HANDLE OFF (HO), and EMERGENCY (EM). The service zone is between minimum reduction and full service positions (MIN and FS). An indicating plate is provided indicating the six operating positions. A description of these six positions is as follows:

1. **RELEASE (RUNNING) Position** – When charging a train or releasing an Automatic brake application, the automatic brake handle should be placed in REL position, which is the position furthest to the left of the engineer.
2. **MINIMUM REDUCTION Position** – When making a Service brake application, move the automatic brake handle toward (right) the engineer to the minimum reduction position. This minimum reduction position provides a 6 to 8 psi (41 to 55 kPa) reduction (note on the IFD Operation display screen: BRAKE CYLINDER reading 10–14 showing pressure has been developed). If necessary to increase the reduction, move the handle progressively toward the engineer, bearing in mind that the further the handle is moved into the service zone, the greater will be the reduction. The EPIC system will automatically maintain any brake pipe leakage.
3. **FULL SERVICE Position** – A Full Service brake application is obtained by moving the brake handle to this position. This position will reduce the Brake Pipe by 26–28 psi (179–193 kPa) and increase the Brake Cylinder pressure to 60–64 psi (413–441 kPa).
4. **SUPPRESSION Position** – This position provides a Full Service brake application and, in addition, on locomotives equipped with overspeed control and safety control penalty brakes, these applications will be suppressed.

WARNING: To ensure safe consist operation, follow specific Railroad precautions for setting-up units for "Trail" or "Dead".

5. **HANDLE OFF Position** – The automatic brake handle should be moved to this position when the locomotive is a trailing unit in a multiple-unit consist or is being towed DEAD.

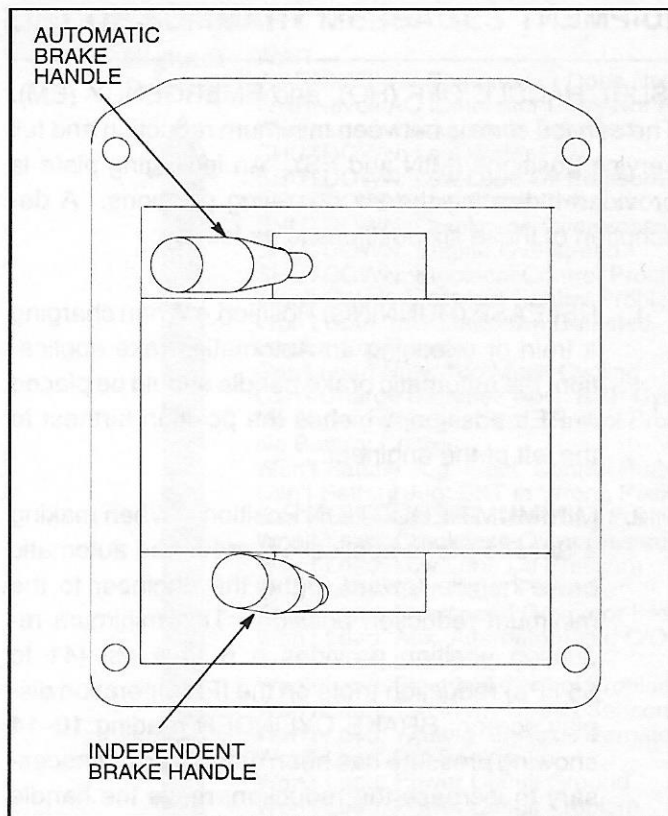


FIG. 12. GE HARRIS CCBII AIR BRAKE CONTROL UNIT (TYPICAL). E-43342.

WARNING: STOPPING HAZARD. In an **EMERGENCY** situation, when operating as a single unit or part of a multi-unit consist (locomotives only), moving the **INDEPENDENT** Brake Handle to **FULL APPLICATION** is the fastest way to develop brake cylinder pressure on the unit/consist up to the full independent brake cylinder pressure setting. Immediately after moving the **INDEPENDENT** Handle, move the **AUTOMATIC** Handle into **EMERGENCY**. Failure to comply with this procedure during an **EMERGENCY** situation, **COULD EXTEND THE STOPPING DISTANCE**.

WARNING: STOPPING HAZARD. Following an **EMERGENCY BRAKE** application, if the train is not at rest, brake release **MUST NOT** be attempted. Any movement of the **AUTOMATIC** Brake Handle to **RELEASE** while train is moving may cause equipment and/or personnel damage.

6. **EMERGENCY** Position – An Emergency brake application is obtained by moving the brake handle to the extreme right of the quadrant. The word **OPERATOR EMERGENCY** will appear yellow in the Air Brake/Alert Box on the Operation display screen for 60 seconds. The operator can recover by moving the brake handle to **RELEASE**.

NOTE: If operating as a lead unit, the control imposes a one minute time delay before it is possible to recharge the brake pipe after an emergency application.

Independent Brake Handle (Fig. 12)

NOTE: If independent brake is applied, dynamic braking effort is decreased depending on locomotive speed, see **DYNAMIC BRAKE OPERATION, Use of Air Brakes During Dynamic Braking** on Page 61.

When applying the locomotive independent brake using the independent brake handle, move the independent handle toward the engineer (Full Independent application – extreme right position), and when releasing, move the handle away from the engineer. The movement of this handle provides input signals to the Electronic Air Brake Microprocessor and duplicates the functions of the former pneumatic brake valve handle.

To make an independent release of an Automatic brake application, move the independent brake handle to **RELEASE** and depress the handle.

WARNING: To ensure safe consist operation, follow specific Railroad precautions for setting-up units for “Trail” or “Dead”.

The independent brake handle should always be in **RELEASE (REL)** position (extreme left) when the unit is a trailing unit in a multiple-unit consist or is being towed **DEAD**.

AIR BRAKE EQUIPMENT IN AIR BRAKE COMPARTMENT

See Figure 14 for location of equipment in the air brake compartment. Presence of equipment will depend on the options selected by a railroad. See the Air Piping Diagram for specific air brake valve locations.

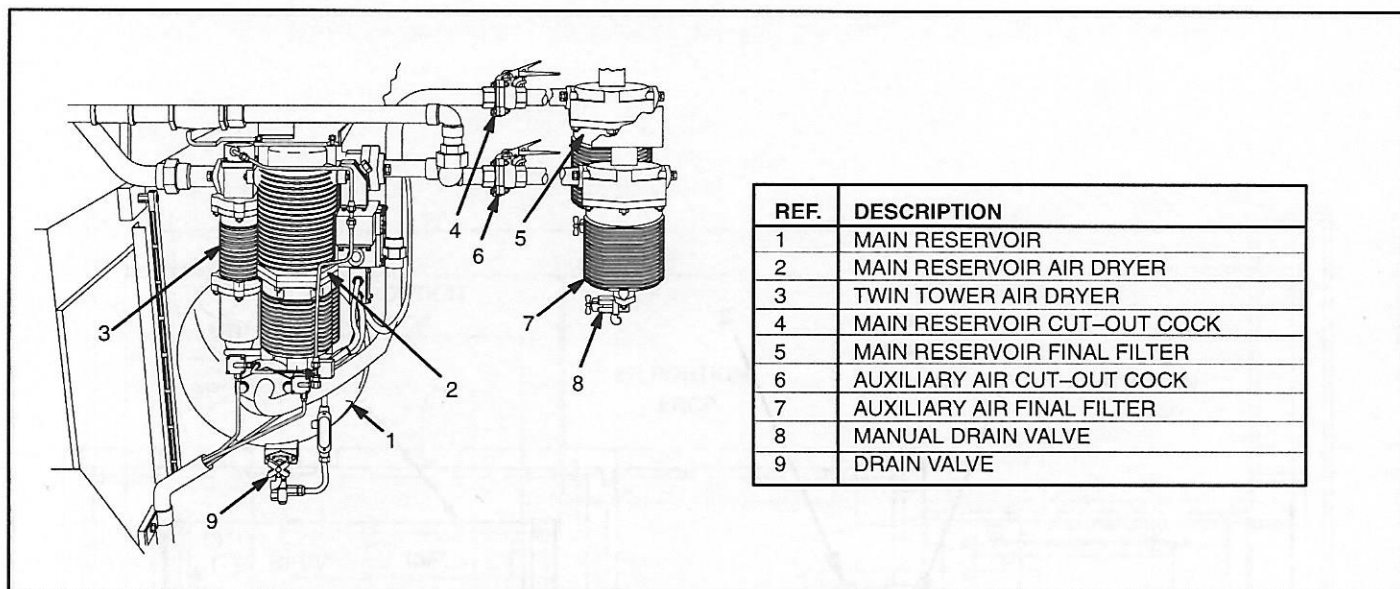
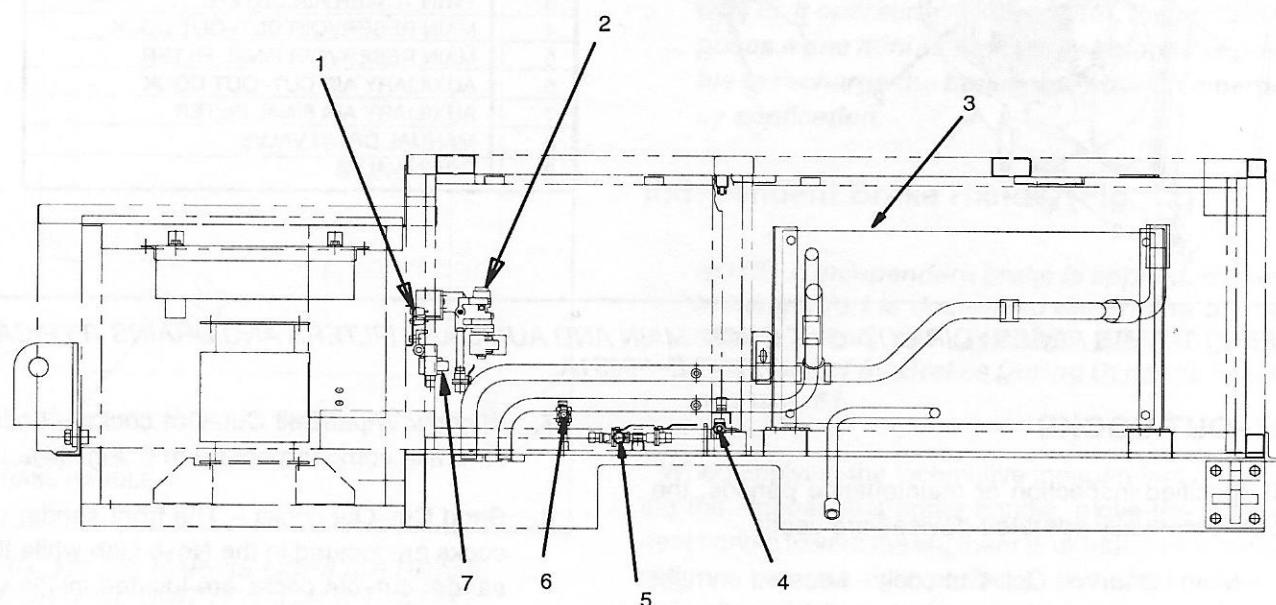


FIG. 13. MAIN RESERVOIR CUT-OUT COCK, MAIN AND AUXILIARY FILTERS AND DRAINS (TYPICAL).
E-39051A.

CUT-OUT COCKS

At specified inspection or maintenance periods, the following manually operated devices are used:

1. Main Reservoir Cut-Out cock – Located on right side of locomotive near the main reservoirs (Item 4, Fig. 13).
2. Main Reservoir Drain cocks – One located on the end of each main reservoir, usually part of automatic drain valves (Item 9, Fig. 13).
3. Air Filter Drain cocks – Located on the main reservoir and auxiliary air filters (Item 8, Fig. 13).
4. Control Air Cut-Out cock – Located in air brake compartment (Item 5, Fig. 14).
5. Control Air Reservoir Drain cock – Located in air brake compartment (Item 6, Fig. 14).
6. Truck (Brake Cylinder) Cut-Out cocks – Located on right side beneath locomotive platform level (one for each truck).
7. Window Wiper/Bell Cut-Out cocks – Located in air brake compartment (Item 5, Fig. 14).
8. Sand Cut-Out cocks – The front sander cut-out cocks are located in the Nose Cab while the rear sander cut-out cocks are located inside the Radiator Cab below the sand box on the left side of the locomotive.
9. Cut-Out Cocks and End Connections in each end of locomotive (Fig. 16):
 - a. Brake Pipe Angle cocks or cut-out cock located under the steps (BP).
 - b. Main Reservoir Equalizing (MR).
 - c. Actuating (ACT).
 - d. Independent Application and Release (A&R).
10. Dead Engine cock – Located in air brake compartment (Item 4, Fig. 14).



REF.	DESCRIPTION
1	DIODES
2	HORN MAGNET VALVE AND CUT-OUT COCK
3	KNORR PNEUMATIC CONTROL UNIT
4	DEAD ENGINE FIXTURE CUT-OUT COCKS
5	CUT-OUT COCKS (CONTROL AIR AND WIPER/BELL)
6	CUT OUT COCK (CONTROL AIR DRAIN)
7	MAGNET VALVES (BMV AND DMV)

FIG. 14. TYPICAL ELECTRONIC AIR BRAKE EQUIPMENT LOCATIONS. E-43343.

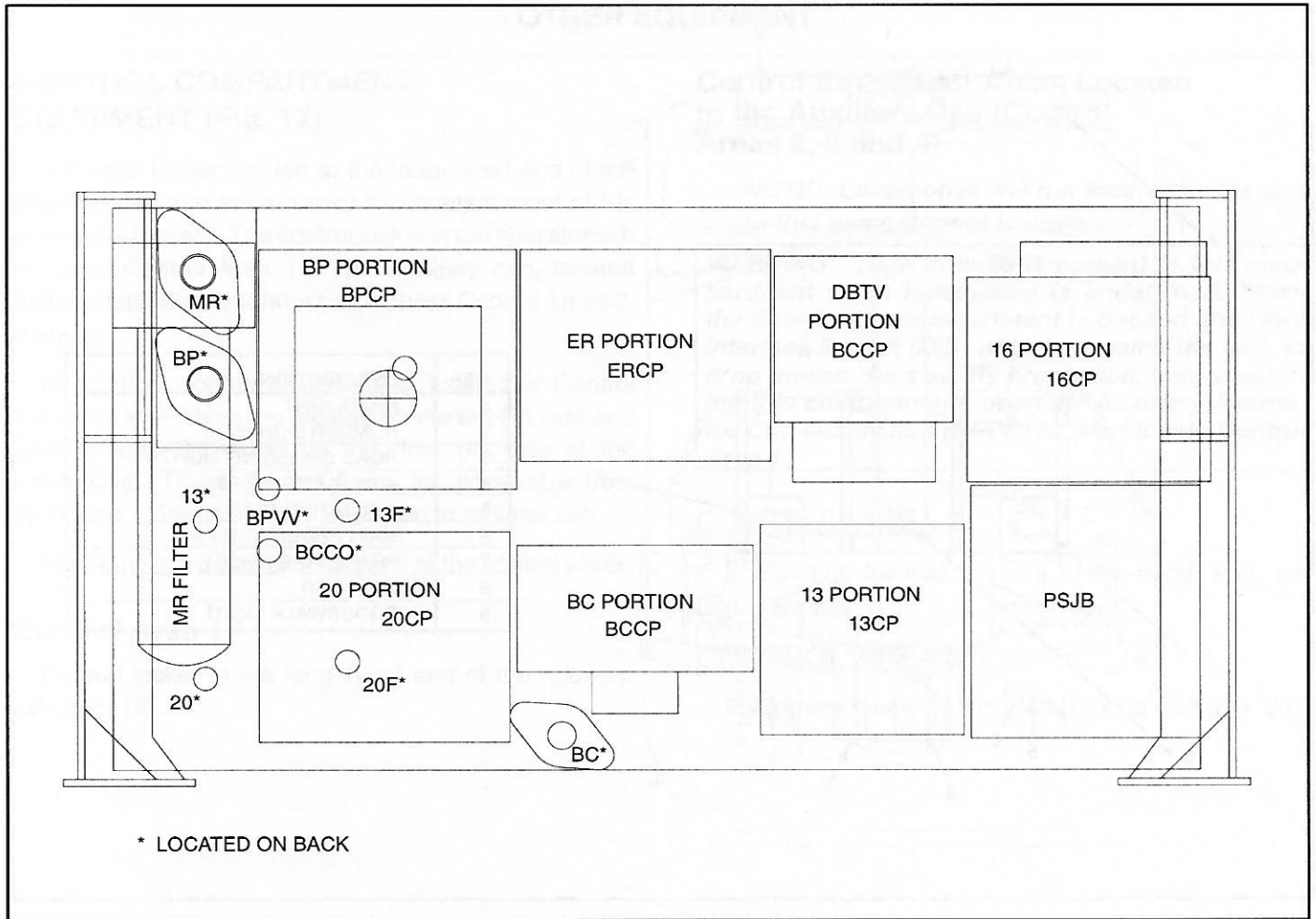


FIG. 15. TYPICAL GE HARRIS CCBII ELECTRONIC AIR BRAKE EPCU ASSEMBLY. E-43344.

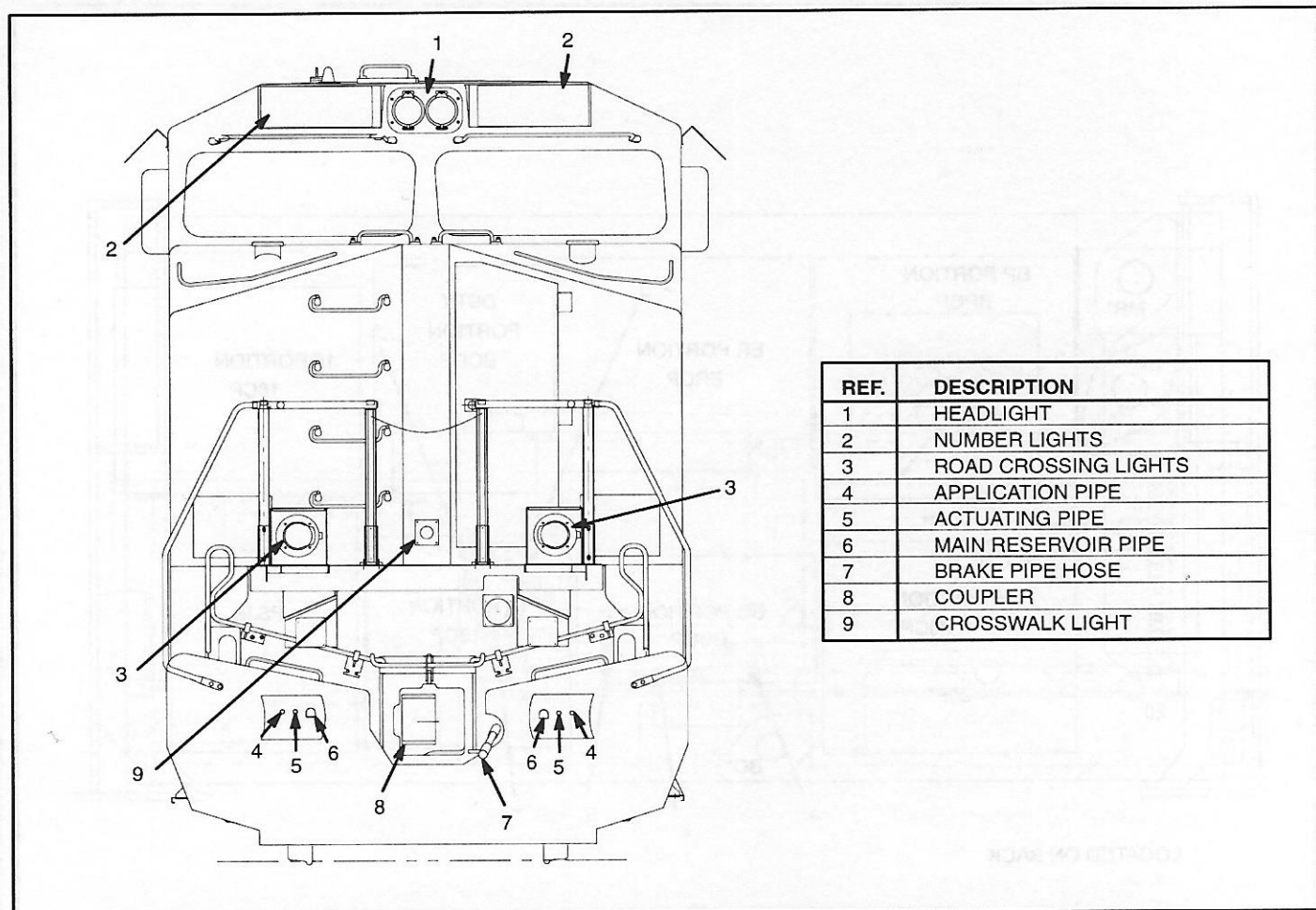


FIG. 16. LOCOMOTIVE SHORT-HOOD ASSEMBLY AND END CONNECTIONS. E-42401.

OTHER EQUIPMENT

CONTROL COMPARTMENT EQUIPMENT (Fig. 17)

A control locker located at the long-hood end of the operator cab and the auxiliary cab contain most of the control equipment. The control locker in the operator cab is called Control Area 1. The auxiliary cab, located directly behind the operator cab, houses Control Areas 2, 3 and 4.

In addition, control equipment is located in Control Areas 6 and 7 which are located on the left (B) side and Control Area 8 located on the right (A) side of the locomotive. These Control Areas are accessible from track level. Control Area 9 is located in radiator cab.

Following is a description of each of the control areas:

Control Area 1

Control locker at the long-hood end of the operator cab (Fig. 18).

Control Equipment Areas Located in the Auxiliary Cab (Control Areas 2, 3 and 4)

NOTE: Locomotive will not load when the door to this compartment is open.

WARNING: High voltage is present in this compartment when locomotive is under load. When the door to this compartment is opened, the Door Interlock Switch (DIS) will trip causing the unit to drop power. As a safety precaution, before entering this compartment, open the Auxiliary Alternator Cut-Out switch (BFCO) located inside Control Area 1.

CONTROL AREA 2

Equipment located on the short-hood end wall (Fig. 19).

CONTROL AREA 3

Equipment located on the left (B) side wall (Fig. 20).

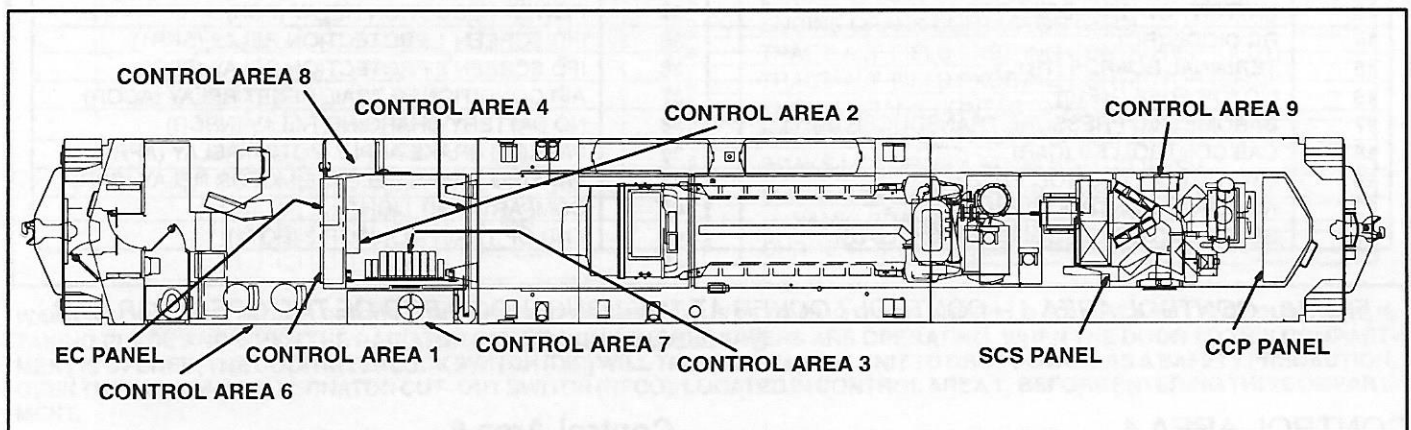


FIG. 17. LOCATION OF CONTROL AREAS. E-42402.

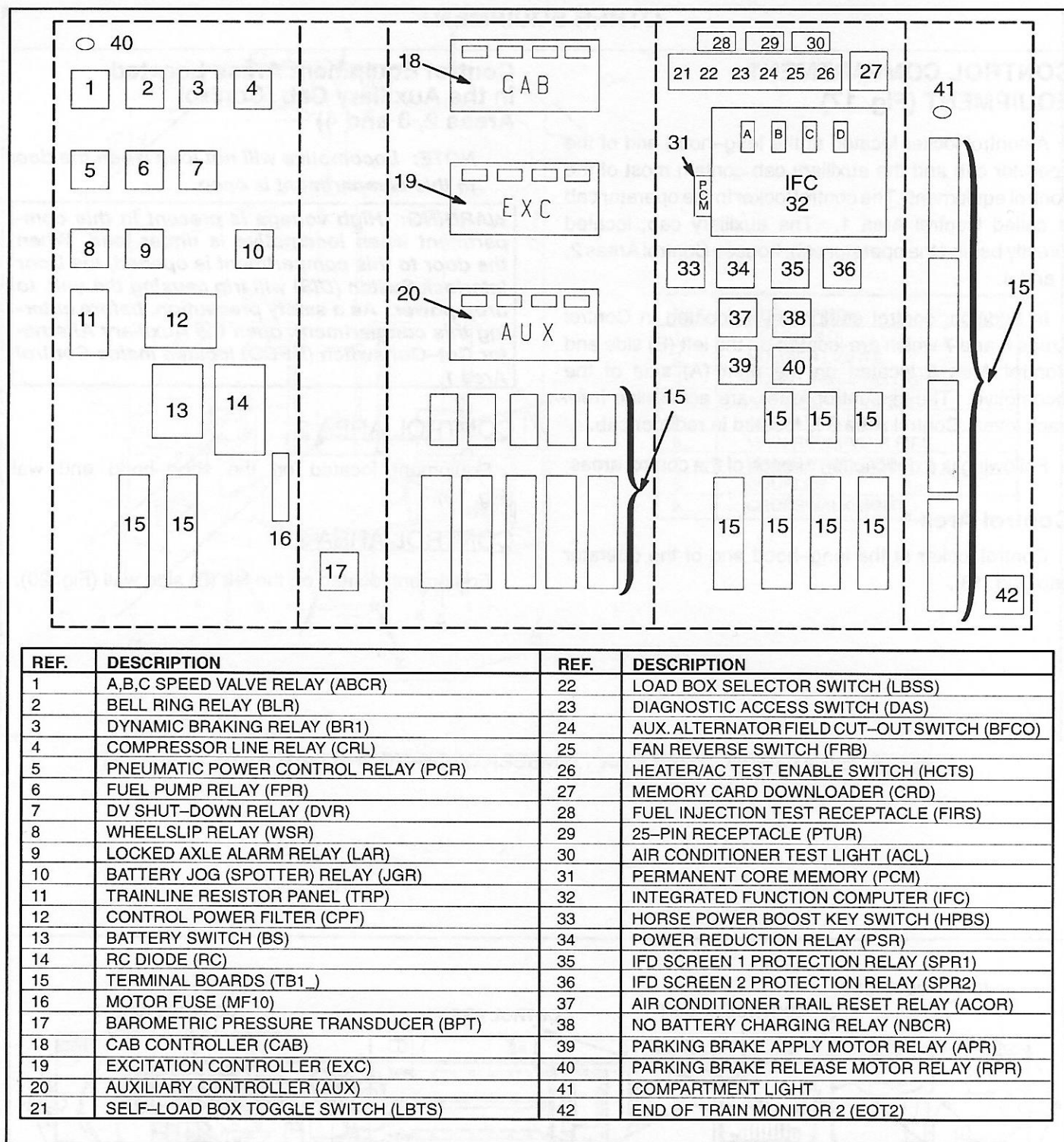


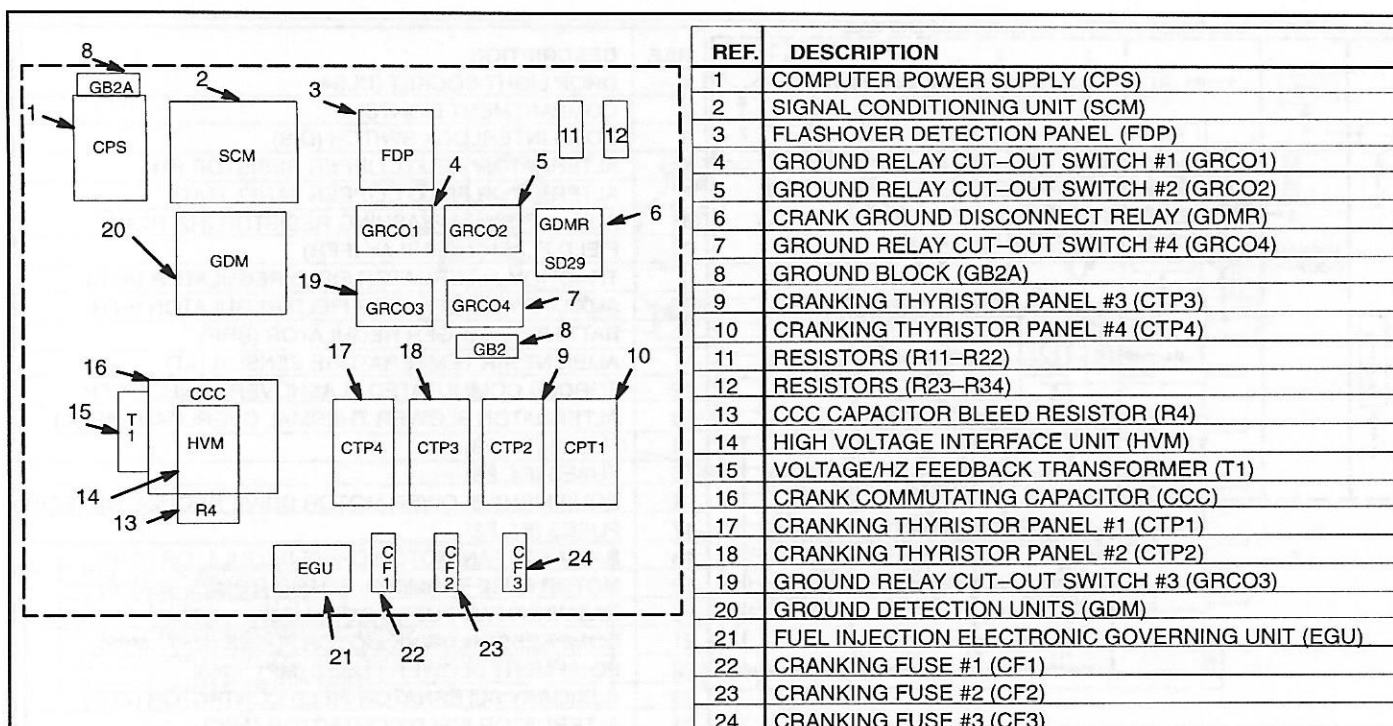
FIG. 18. CONTROL AREA 1 – CONTROL LOCKER AT THE LONG-HOOD END OF THE OPERATOR CAB.
E-43320.

CONTROL AREA 4

Equipment located on the long-hood end wall and the right (A) side wall (Fig. 21).

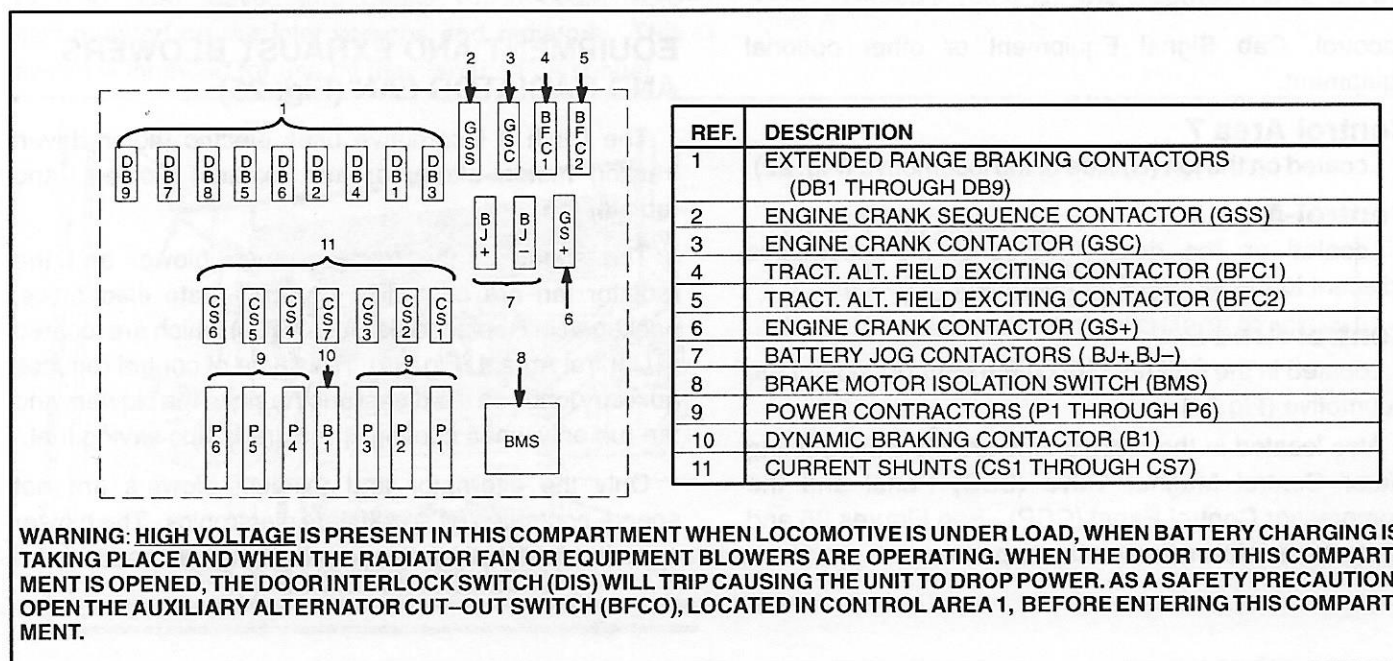
Control Area 6

Located on the left (B) side of the locomotive, beneath the short hood and operator cab. It is reserved for



WARNING: HIGH VOLTAGE IS PRESENT IN THIS COMPARTMENT WHEN LOCOMOTIVE IS UNDER LOAD, WHEN BATTERY CHARGING IS TAKING PLACE AND WHEN THE RADIATOR FAN OR EQUIPMENT BLOWERS ARE OPERATING. WHEN THE DOOR TO THIS COMPARTMENT IS OPENED, THE DOOR INTERLOCK SWITCH (DIS) WILL TRIP CAUSING THE UNIT TO DROP POWER. AS A SAFETY PRECAUTION, OPEN THE AUXILIARY ALTERNATOR CUT-OUT SWITCH (BFCO), LOCATED IN CONTROL AREA 1, BEFORE ENTERING THIS COMPARTMENT.

FIG. 19. CONTROL AREA 2 – EQUIPMENT LOCATED ON THE SHORT-HOOD END WALL. E-43321.



WARNING: HIGH VOLTAGE IS PRESENT IN THIS COMPARTMENT WHEN LOCOMOTIVE IS UNDER LOAD, WHEN BATTERY CHARGING IS TAKING PLACE AND WHEN THE RADIATOR FAN OR EQUIPMENT BLOWERS ARE OPERATING. WHEN THE DOOR TO THIS COMPARTMENT IS OPENED, THE DOOR INTERLOCK SWITCH (DIS) WILL TRIP CAUSING THE UNIT TO DROP POWER. AS A SAFETY PRECAUTION, OPEN THE AUXILIARY ALTERNATOR CUT-OUT SWITCH (BFCO), LOCATED IN CONTROL AREA 1, BEFORE ENTERING THIS COMPARTMENT.

FIG. 20. CONTROL AREA 3 – EQUIPMENT LOCATED ON THE LEFT-SIDE WALL. E-43322.

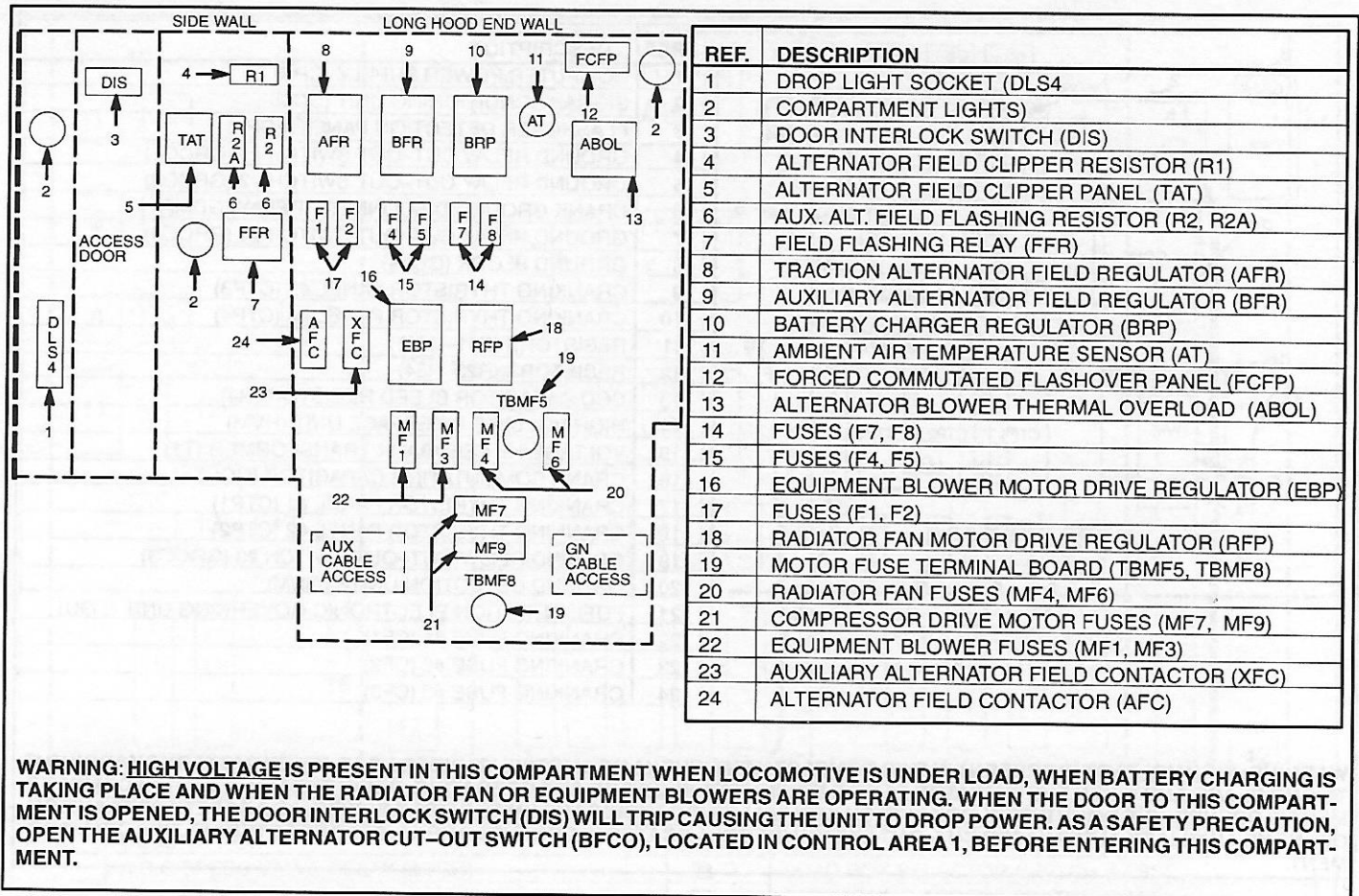


FIG. 21. CONTROL AREA 4 – EQUIPMENT LOCATED ON THE LONG-HOOD END WALL AND THE RIGHT-SIDE WALL. E-41515.

Locotrol, Cab Signal Equipment or other optional equipment.

Control Area 7

Located on the left (B) side of the locomotive (Fig. 22).

Control Area 8

Located on the right (A) side of the locomotive adjacent to the air brake compartment (Fig. 23).

Control Area 9

Located in the radiator cab on the right (A) side of the locomotive (Fig. 24).

Also located in the radiator cab are the Split Cooling Water Control Magnet Valve (SCS) Panel and the Compressor Control Panel (CCP). See Figures 26 and 27 for more information on these panels.

EQUIPMENT AND EXHAUST BLOWERS AND RADIATOR FAN (Fig. 25)

The Dash 9 locomotive uses electric motor-driven traction motor, alternator and exhaust blowers, and radiator fan.

The speed of the traction motor blower and the radiator fan are controlled by solid-state electronics, packaged in Replaceable Units (RUs) which are located in Control Area 4 (Fig. 21). This type of control reduces auxiliary loads on the diesel engine since the blowers and fan run only when cooling is required, thus saving fuel.

Only the alternator and exhaust blowers are not speed-controlled by solid-state electronics. The blower speeds are directly proportional to engine speed.

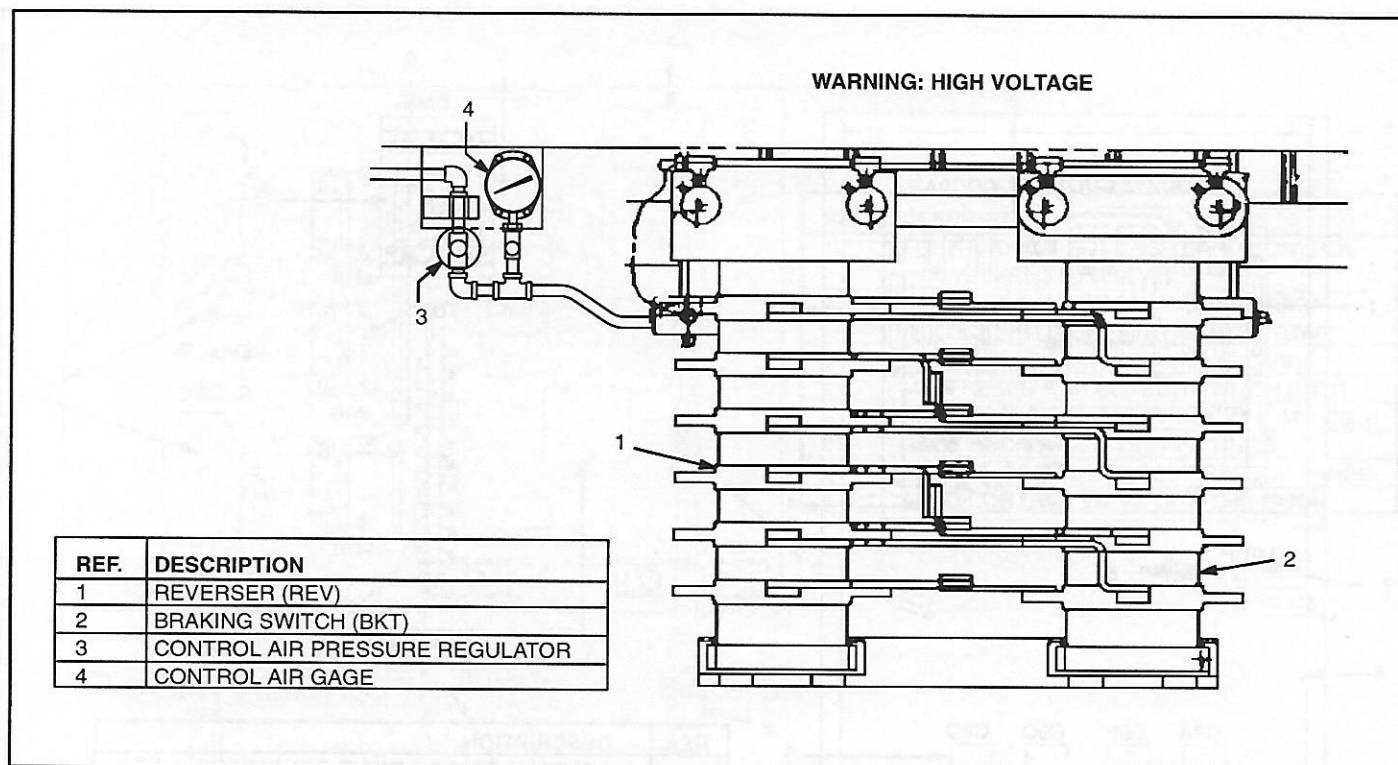


FIG. 22. CONTROL AREA 7 – LOCATED ON THE LEFT SIDE OF THE LOCOMOTIVE. E-40702.

A Fan Reverse switch, located in Control Area 1 (Item 25, Fig. 18), can be used to operate the radiator fan in reverse direction for a period of 60 seconds. This is to help clear leaves and debris which could have accumulated on the inlet screens and radiators. This switch is intended for use by maintenance personnel.

NOTE: For the traction motor blower and the radiator fan, note the following:

1. If cooling water temperature is below 150 F (65.5 C), the traction motor blower

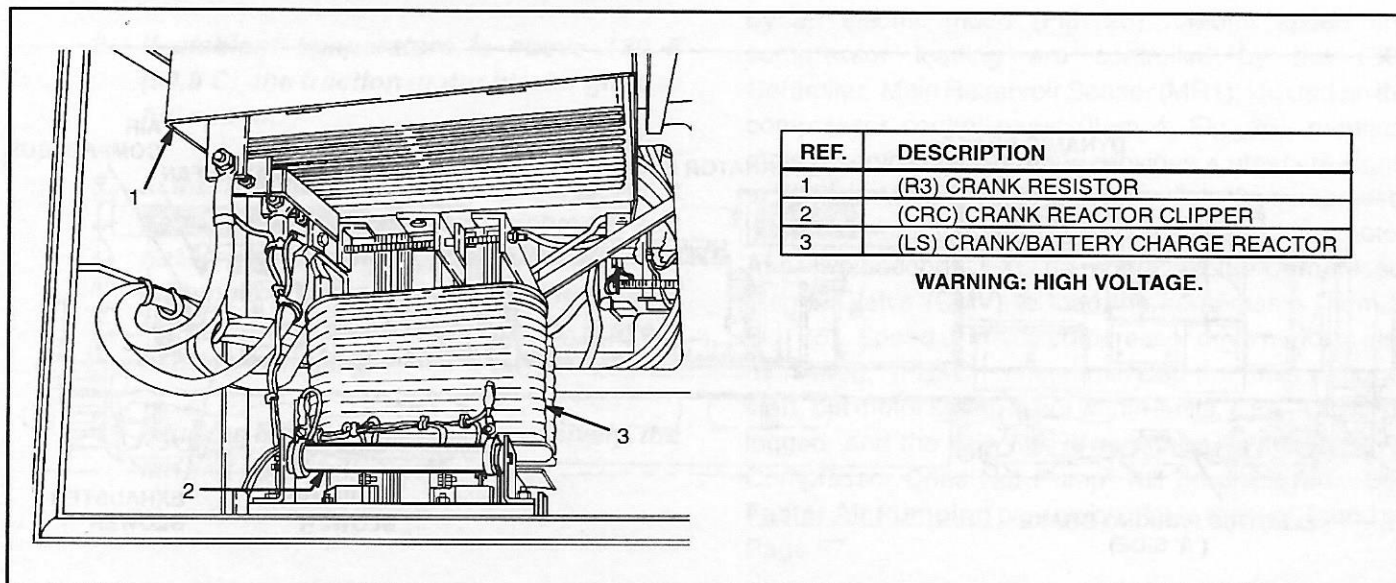


FIG. 23. CONTROL AREA 8 – LOCATED ON THE RIGHT SIDE OF THE LOCOMOTIVE ADJACENT TO THE AIR BRAKE COMPARTMENT. E-31359B.

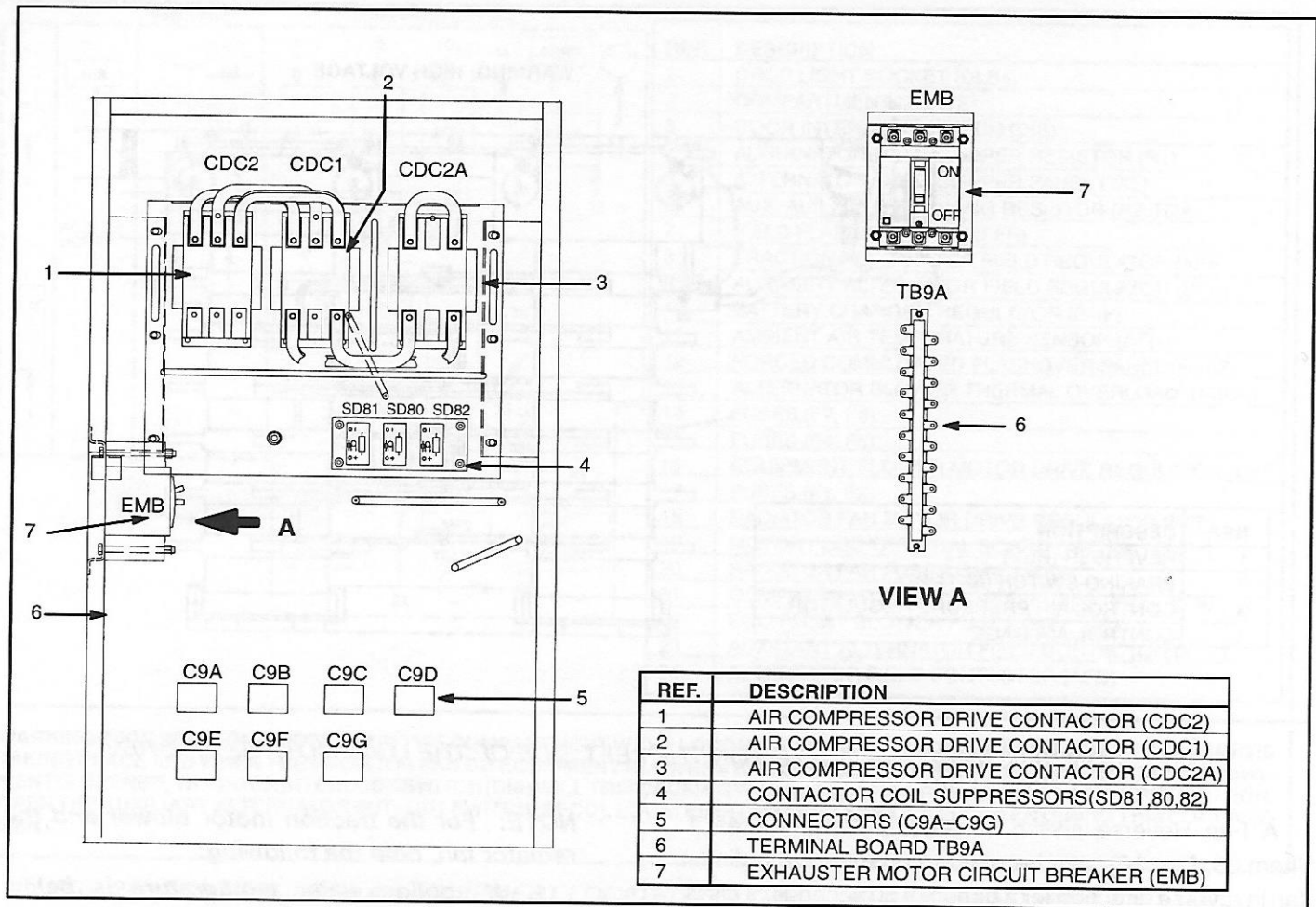


FIG. 24. CONTROL AREA 9 - LOCATED IN THE RADIATOR CAB ON THE RIGHT SIDE OF THE LOCOMOTIVE). E-42874.

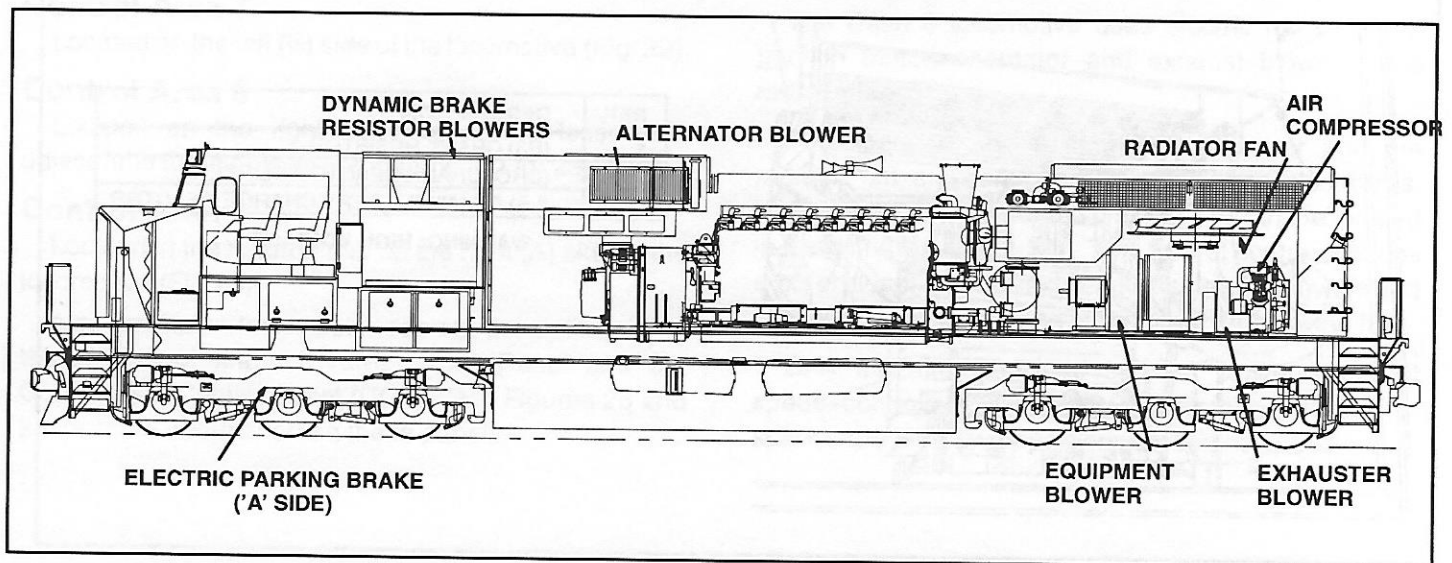


FIG. 25. LOCATION OF EQUIPMENT, DYNAMIC BRAKING, EXHAUSTER AND ALTERNATOR BLOWERS, ELECTRIC PARKING BRAKE, AND RADIATOR FAN. E-43324.

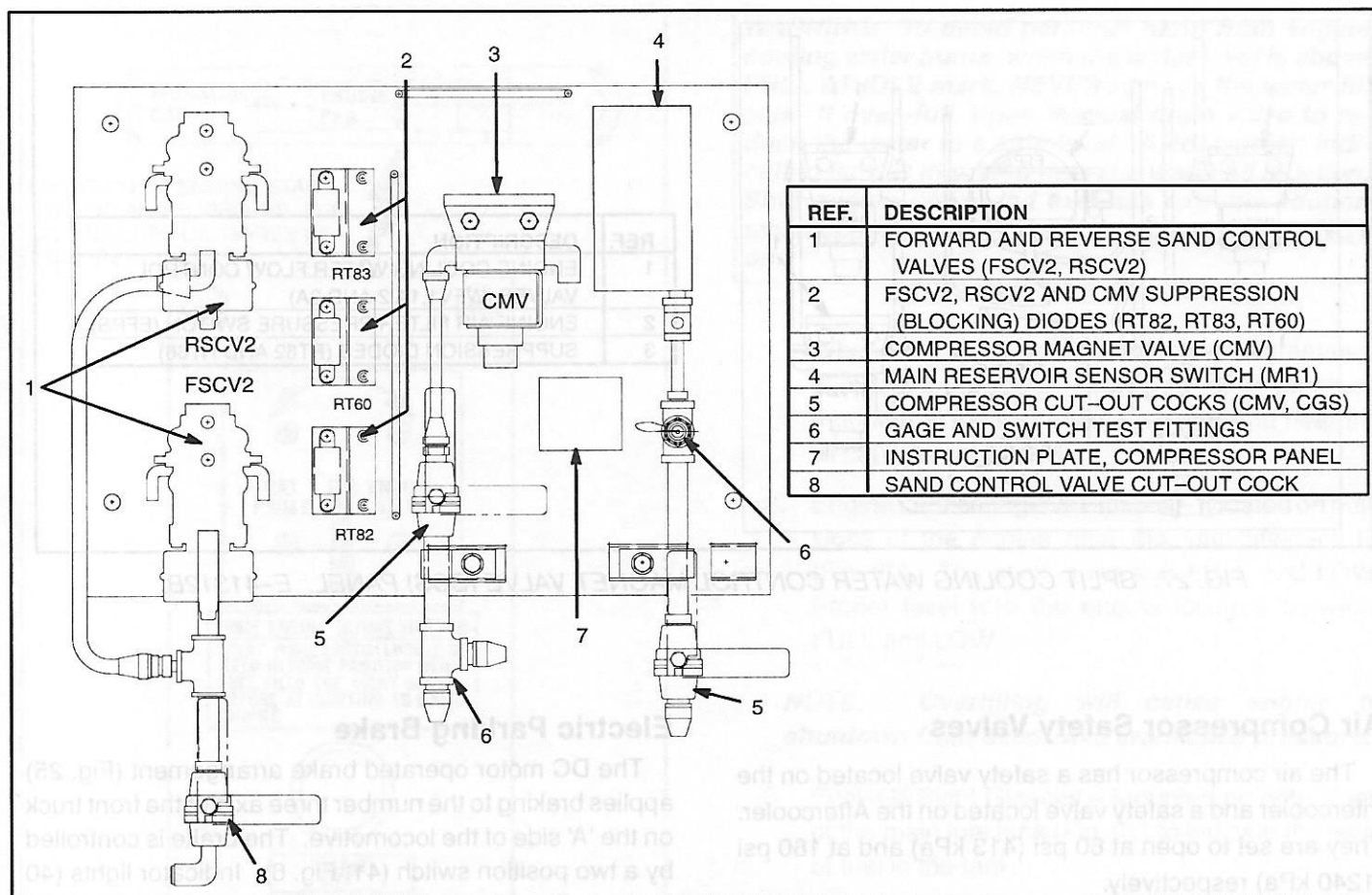


FIG. 26. AIR COMPRESSOR CONTROL PANEL (CCP) AND PIPING. E-43323.

goes to full speed to draw load and warm the engine.

- 2. If ambient temperature is above 130 F (54.5 C), the traction motor blower goes to full speed.**
- 3. If the radiator fan is not operated for a period of 30 minutes and locomotive is not in a power mode, the controllers will automatically operate the fan at full speed for a period of 10 seconds to prevent bearing brinelling.**
- 4. If the fan has been cycling excessively, the fan will go to full speed.**

AIR COMPRESSOR

All Dash 9 locomotives use an air compressor driven by an electric motor (Fig. 25). Motor speed and compressor loading are controlled by the EXC Controller. Main Reservoir Sensor (MR1), located on the compressor control panel (Item 4, Fig. 26), monitors main reservoir pressure and provides a pressure signal to EXC via AUX. EXC, in turn, energizes the compressor drive contactor to start the air compressor drive motor. After two seconds, EXC de-energizes the Compressor Magnet Valve (CMV) to load the compressor (Item 3, Fig. 26). Speed of the air compressor drive motor is also monitored. If EXC has commanded the drive motor to start, but motor speed is not within limits, a FAULT will be logged, and the SUMMARY message "WARNING! Air Compressor Does Not Pump" will be displayed. See **Faster Air Pumping** paragraph of this manual, found on Page 57.

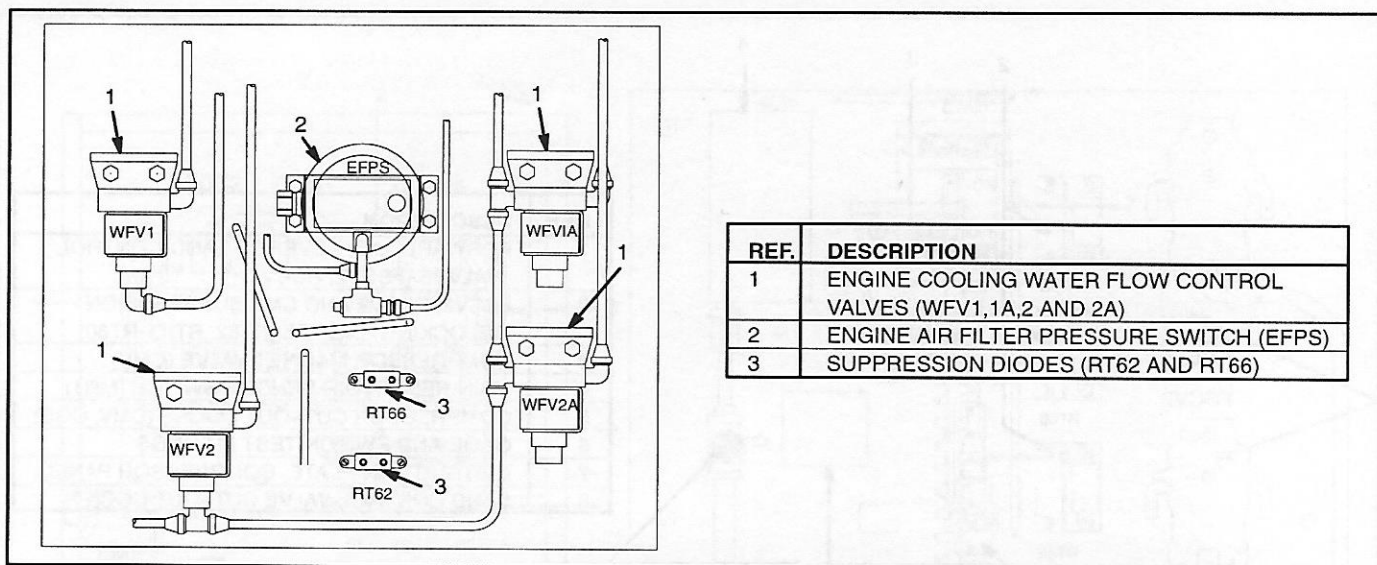


FIG. 27. SPLIT COOLING WATER CONTROL MAGNET VALVE (SCS) PANEL. E-41312B.

Air Compressor Safety Valves

The air compressor has a safety valve located on the Intercooler and a safety valve located on the Aftercooler. They are set to open at 60 psi (413 kPa) and at 180 psi (1240 kPa) respectively.

Air Compressor Governor Cut-Out Cock

Air Compressor Governor Cut-Out cock – Mounted on the compressor control panel (Item 5, Fig. 26) located in the radiator cab. This panel is accessible from the right side of the locomotive.

ENGINE START STATION AND START SWITCH (Fig. 28)

The Engine Start Station is located in the engine cab next to the main traction alternator. It consists of an engine PRIME/START switch, which is used to start the diesel engine, and an ENGINE STOP pushbutton.

MISCELLANEOUS EQUIPMENT

Main Reservoir Safety Valve

This safety valve is located in the piping to the first main reservoir. This valve is set to open at 150 psi (1034 kPa).

Electric Parking Brake

The DC motor operated brake arrangement (Fig. 25) applies braking to the number three axle of the front truck on the 'A' side of the locomotive. The brake is controlled by a two position switch (41, Fig. 6). Indicator lights (40 and 41, Fig. 6) show the status of the electric parking brake.

Engine Stop and Emergency Fuel Cut-Off System

In an emergency, any one of four electric pushbuttons may be depressed momentarily to cut off fuel delivery to the engine. One of these pushbuttons is located on each side of the locomotive platform near the fuel tank (Item 2, Fig. 31). The third and fourth pushbuttons are located on the Engine Control (EC) panel (Item 7, Fig. 6) and at the Start Station (Fig. 28) and are normally used for cutting the fuel delivery to the engine.

NOTE: The Emergency Cut-Off button is used to cut the fuel delivery to the engine on the local units only.

PRESSURE AND TEMPERATURE GAGES

1. Control Air Gage – Located in Control Area 7 (Fig. 22). Normal control air pressure is 80 psi (551 kPa).

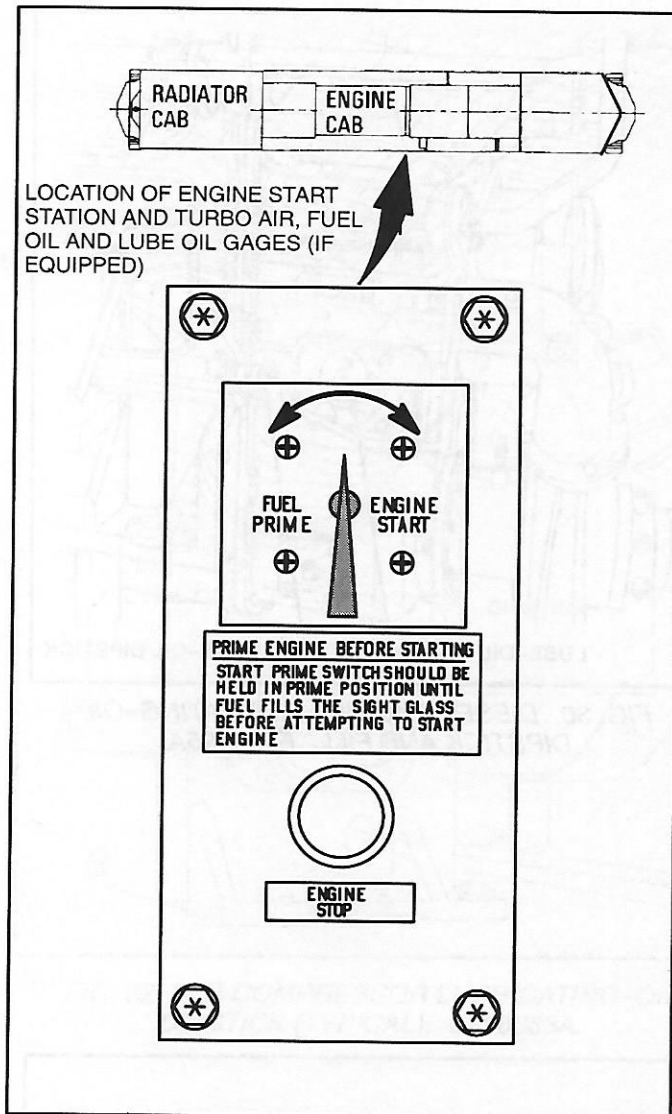


FIG. 28. ENGINE START STATION. E-39074.

NOTE: The following values are nominal because of varying conditions.

2. Water Temperature Gage – Located on the right side of the water storage tank (Fig. 29). Normal operating temperature is 188–200 F (87–93 C).

OTHER GAGES

1. Cooling Water – A water level sight glass mounted on the right side of the cooling water storage tank (Fig. 29) indicates the level of the cooling water. Markings near the sight glass indicate the proper level for various conditions of the system.

WARNING: To avoid personal harm from engine cooling water burns, when the water level is above FULL AT IDLE mark, NEVER remove the water fill cap. If over-full, open manual drain valve to reduce the water to a safe level. Also, a green indicating light is mounted near the water fill location. Shut engine down and exercise extreme caution when opening the fill cap if this green light is **NOT** on.

When filling the system or adding water treatment compound, proceed according to instructions mounted at the water storage tank area near the fill cap. Do not overfill.

2. Engine Lubricating–Oil Dipstick – Located on both sides of the engine near the lubricating–oil fill (Fig. 30). The stick is marked FULL and LOW. Proper level with the engine idling is between FULL and LOW.

NOTE: Overfilling will cause engine to shutdown from excessive crankcase pressure.

3. Fuel–Oil Sight Glasses – Mounted on both sides of the main fuel tank (Fig. 31) to indicate the level of fuel in the tank.
4. Compressor Lubricating Oil (Fig. 32) – A dipstick, located near the fill cap, can be used to determine the oil level in the compressor crankcase.

DRAINING COOLING WATER SYSTEM

The cooling water system may be drained by opening the main water drain valve on the right side of the locomotive near the lubricating–oil pump (Fig. 33).

An optional Automatic Water Dump System will dump the engine cooling water when the engine is shutdown and water temperature is below 40 F (4.5 C). A thermostat actuates, tripping the solenoid in the water drain valve which opens the automatic drain valve and permits the rapid draining of the cooling water into the retention tank (if equipped).

This system also has a Control switch located on the water tank. This switch can be used when filling the system with cold water.

CAUTION: During freezing weather, protect the engine cooling system according to railroad instructions.

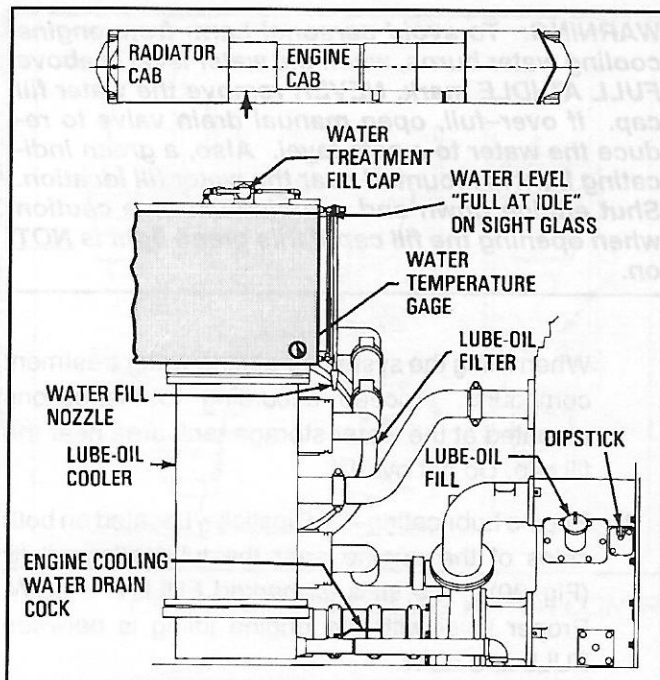


FIG. 29. ENGINE COOLING WATER SIGHT GLASS (TYPICAL). E-34100A.

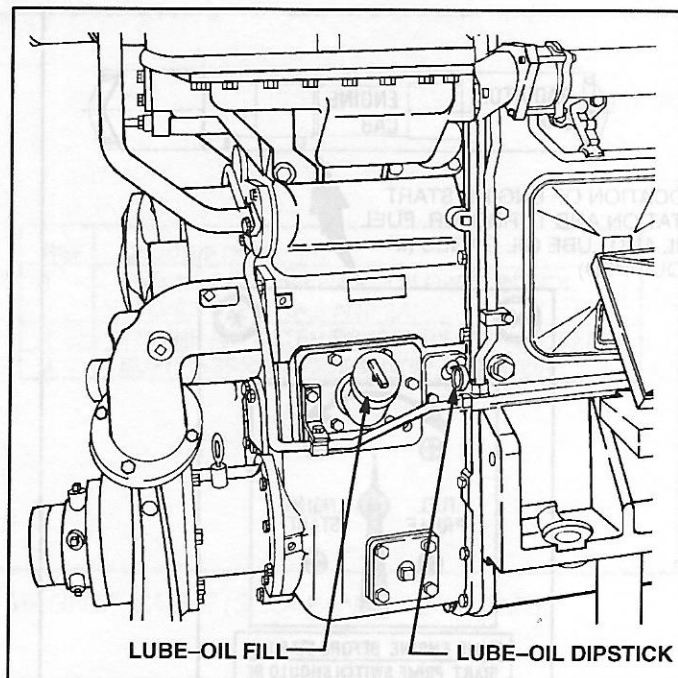
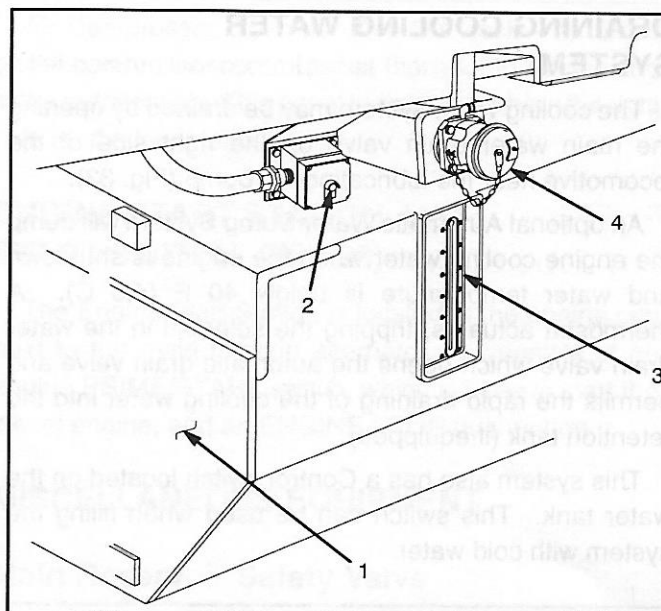


FIG. 30. DIESEL ENGINE LUBRICATING-OIL DIPSTICK AND FILL. E-32795A.



REF.	DESCRIPTION
1	FUEL TANK
2	FUEL EMERGENCY CUT-OFF BUTTON
3	FUEL SIGHT GLASS
4	FUEL FILL

FIG. 31. "B" SIDE OF FUEL TANK (TYPICAL). E-42151.

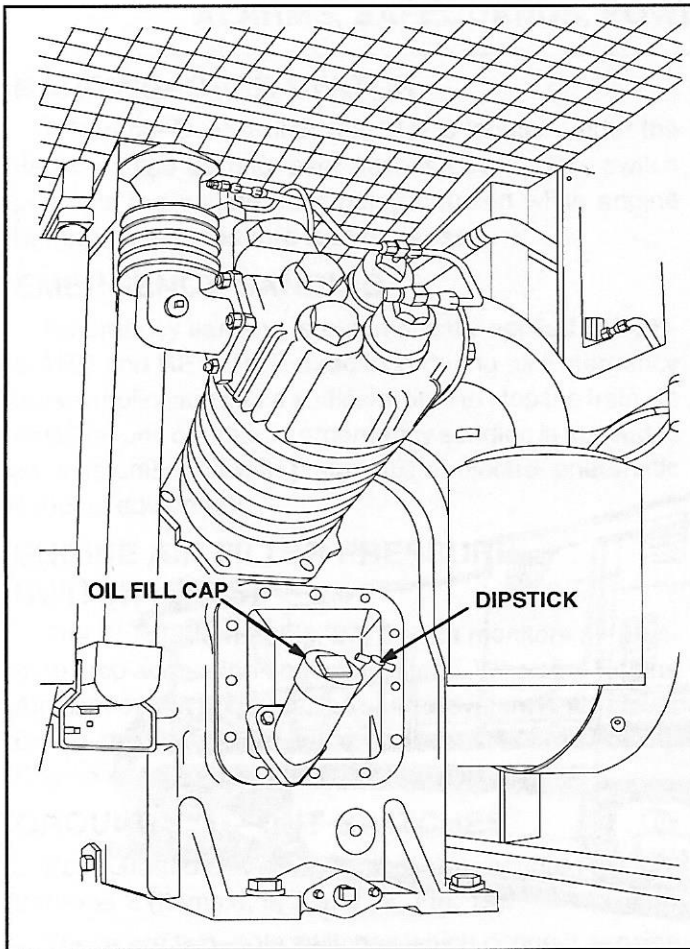


FIG. 32. AIR COMPRESSOR LUBRICATING-OIL DIPSTICK (TYPICAL). E-38383A.

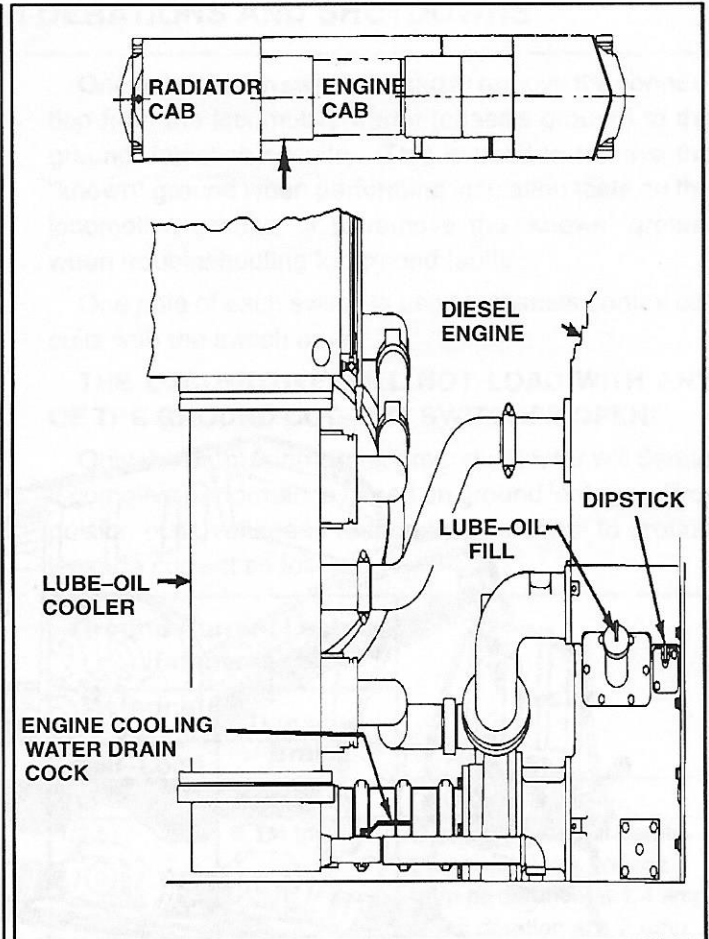
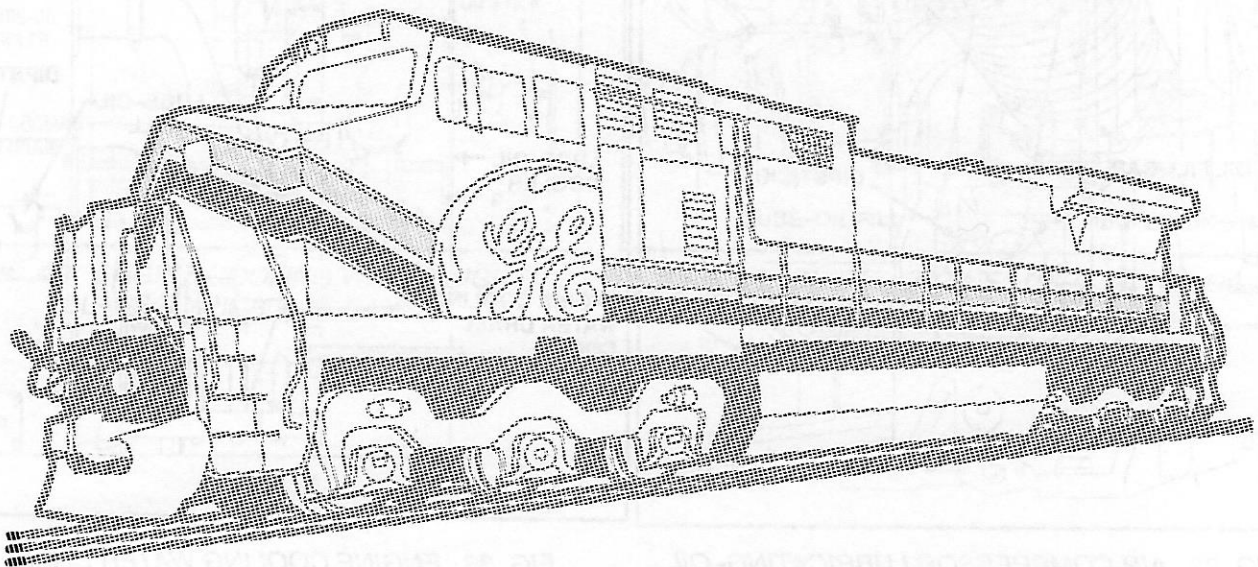


FIG. 33. ENGINE COOLING WATER DRAIN (TYPICAL). E-34102A.



ALARMS, SAFEGUARDS, POWER DERATIONS AND SHUTDOWNS

BARRING-OVER SWITCH

A Barring-Over switch (Fig. 34) is located under the diesel engine barring-over access cover. This switch prevents the engine from being cranked while engine barring-over procedure is in progress.

EMERGENCY SANDING

Emergency sanding is automatically applied in FORWARD and REVERSE directions during all Emergency brake applications for a sufficient time to stop the train. In multiple-unit operation, emergency sanding is applied to all units equipped with pneumatic or electro-pneumatic sanding equipment.

ENGINE AIR FILTER PRESSURE SWITCH (EFPS)

The EFPS (Item 2, Fig. 27) Switch monitors air pressure drop across the engine air filters. When the Engine Air Filter switch operates, the control system limits power to two-thirds of power call and all notches are affected. Engine speed, however, is not affected.

GROUND CUT-OUT SWITCHES

Four Ground Cut-Out switches are mounted in Control Area 2 (Items 4, 5, 7 and 24, Fig. 19).

These are two-pole switches which connect sensing circuits to detect ground leakage current in the following circuits:

1. Propulsion circuit (GRCO1)
2. Excitation supply circuit (GRCO2)
3. Auxiliary motor supply circuit (GRCO3)
4. Battery charging circuit (GRCO4).

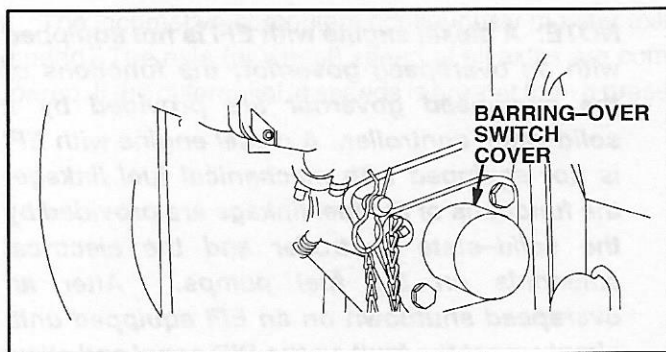


FIG. 34. ENGINE BARRING-OVER SWITCH.
E-41286.

One pole of each switch is used to remove the connection from the locomotive frame (chassis ground) to the ground detection circuitry. This is used to remove the "known" ground when performing insulation tests on the locomotive circuits, or to remove the "known" ground when troubleshooting for ground faults.

One pole of each switch is used to disable control circuits with the switch open.

THE LOCOMOTIVE WILL NOT LOAD WITH ANY OF THE GROUND CUT-OUT SWITCHES OPEN!

Only the propulsion circuit ground detector will derate locomotive performance based on ground leakage. Propulsion buss voltage is reduced proportional to ground leakage current as follows:

Ground Current Leakage (amperes)		Result
Motoring or Self-Load	Dynamic Brake	
0 to 1/2	0 to 1/4	Causes no deration.
1/2 to 1	1/4 to 1/2	Is range which will derate propulsion buss voltage from no deration at 1/4 amp to full deration at 1/2 amp.
Above 1	Above 1/2	Is considered a "solid" ground fault. Power is reduced to zero.

The other ground leakage detectors will not derate locomotive performance, but when grounds are detected, alarms will be sounded and faults will be logged on the Diagnostic Display Panel.

MOTOR AND SPEED SENSOR CUT-OUT SWITCHES

NOTE: Under emergency conditions, the locomotive may be operated for a short period of time with one or more traction motors cut-out. Refer to Railroad Rules for specific details of operation.

Traction motors can be cut out manually or automatically. Manual cut out is done with individual Motor Cut-Out switches on the EC panel (Items 21-26, Fig. 6). If a fault condition such as excessive current or too great a rate of change of current (Motor Flashover) is detected, automatic cut out is done by the microcomputer control.

CAUTION: It is recommended that motors only be manually cut out when the Engine Control switch is in START or ISOLATE position (unit isolated) and the Throttle handle is in IDLE.

NOTE: Speed sensors do not need to be cut out on cut out motors. When the Motor Speed Sensor switch is in the CUT-OUT position (Item 27, Fig. 6), the speed signals from the speed sensors on motors which are cut out are ignored. For more information, see Speed Sensor Cut-Out Switch paragraph in Operating Controls.

When a motor or motors are cut out, total power available for traction is adjusted as follows:

Motors Cut-Out	Horsepower Available for Input for Traction
All IN	Full HP
1 Out	Full HP
2 Out	Full HP
3 Out	3063 (See Note 1)
4 Out	2042 (See Note 1)
5 Out	1021 (See Notes 1 and 2)
6 Out	None
<p>NOTE 1: Horsepower available for input for traction is limited to 1021 horsepower per each traction motor CUT IN.</p> <p>NOTE 2: Speed sensor inputs from at least two traction motors are required for locomotive to load.</p>	

NOTE: If any motor is cut out on a locomotive, Dynamic Braking and Self-Load on that locomotive are cut out.

OIL AND WATER TEMPERATURE AND PRESSURE

Horsepower and/or engine speed will be altered if one of the following conditions exist:

Cold Engine

In order to protect a cold engine, restrictions are placed on engine load and speed until engine temperature has reached 140 F (60 C) or higher for more than three minutes. Also, to keep engine operating temperatures within certain limits, engine speed will be altered when temperature drops below certain limits.

Hot Engine

Oil or Water Temperature Between 230 and 239 F (110 and 115 C)

Engine RPM goes to Notch 8 and power is derated from no deration at 230 F (110 C) to full deration (79% power) at 235 F (115 C). (Engine returns to requested Notch speed when temperature drops to 218 F – 103.5 C.)

NOTE: The engine will operate at 79% power between 236 and 239 F (113 and 115 C) for three minutes before the engine goes to IDLE.

Oil or Water Temperature At 240 F (115.5 C) and Above

If the oil or water temperature exceeds 240 F (115.5 C), engine RPM Goes to IDLE and load goes to zero.

Low Oil or Low Water Pressure

Low oil and water pressure are monitored by the EGU controller. If low oil or water pressure is detected, power is reduced by one notch every 20 seconds (water) or three seconds (oil), down to Notch 2. As pressure recovers, notch is increased.

If low water pressure continues to occur, the load will go to zero and the engine will remain at IDLE. If low oil pressure continues to occur, the engine will be shut down.

OVERSPEED – ENGINE SHUTDOWN

NOTE: A diesel engine with EFI is not equipped with an overspeed governor; the functions of the overspeed governor are provided by a solid-state controller. A diesel engine with EFI is not equipped with mechanical fuel linkage; the functions of the fuel linkage are provided by the solid-state controller and the electrical solenoids on the fuel pumps. After an overspeed shutdown on an EFI equipped unit, simply reset the fault on the DID panel and allow the fuel pump motor to cycle OFF – the control does the rest.

PCS FUNCTION OPERATION

The Pneumatic Control Switch (PCS) Function is controlled by the Electronic Air Brake system (Item 6, Fig. 14). During a safety control Penalty or Emergency brake application (power knockdown), this function activates. The Brake Control Computer signal (through the PCR relay) will affect engine speed (limited to Idle or Notch 1), available locomotive power and light the "PCS OPEN" warning light on the Operation Screen (Fig. 4).

Operating options selected by the railroad will determine how the locomotive control system will react to PCS operation. See railroad operating rules and the locomotive air piping and electrical schematic diagram for application to specific locomotives.

To reset the PCS Function:

1. Move the **Throttle** handle to IDLE.

NOTE: If the PCS Function has tripped while in dynamic braking, the Braking handle must be returned to OFF to reset the circuit.

2. Following the IFD display prompts, for **Penalties**, proceed to **Step a**. For **Emergencies**, proceed to **Step b**.
 - a. Move the Automatic Brake handle to SUPPRESSION and wait at least 10 seconds for Power Up, Overspeed or other Penalty applications.
 - b. Move the Automatic Brake handle to EMERGENCY and wait at least 60 seconds for Trainline, Operator, EOT or Fireman Emergencies.
3. Move the Automatic Brake handle, when instructed and ready, to RELEASE.

WHEELSLIP

The locomotive computers continuously monitor axle speed. The axle (or wheel) speed of all axles are compared. If the differential in speeds is greater than a preset

limit, power will be reduced and sand applied. Once the differential in speeds falls within the preset limit, power will be returned to the motors (per engine load rate schedule).

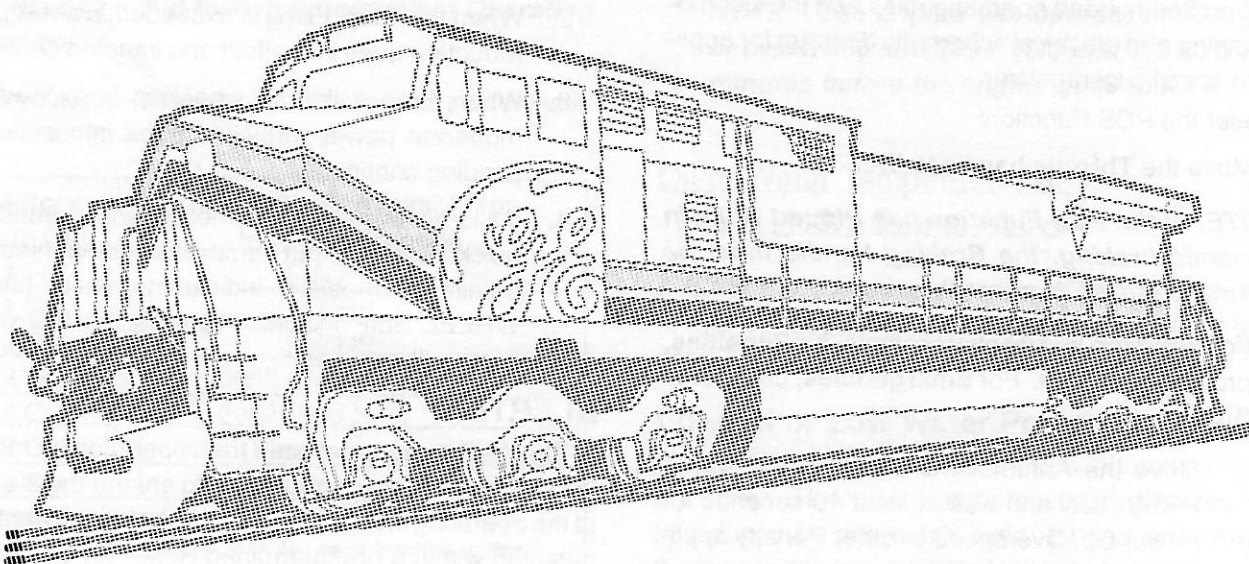
In dynamic braking, the amount of correction is determined by the amount of slide and is accomplished in several steps:

1. Automatically apply sand to the leading axles on this locomotive if a small difference in motor speeds is detected. Sanding continues for three seconds after the slide is corrected.
2. When the **Step 1** limit is exceeded, a small power reduction goes into effect and sanding continues.
3. When **Step 2** limit of wheelslip is exceeded, a moderate power reduction goes into effect and sanding continues.
4. If a large difference in wheel speeds is detected, a quick power output removal accompanied by a trainlined wheelslip indication results and the WHEEL SLIP indicator light on the IFD display screen illuminates.

ALERter

The Alerter promotes safe train operation by monitoring various operator movements to ensure the alertness of the operating crew. If a proper control movement is not detected within a predetermined Reset Time period, an alarm sequence including audible and visual alarms is started requesting an acknowledgement. Lack of response to the system during this time will result in a penalty brake application by de-energizing the Alerter Magnet Valve. This action will command a full service brake application bringing the locomotive to a stop.

Proper control movements (Resets) are: Touching the Alerter Reset Whisker Switch (Item 5, Fig. 3), Pressing the Horn or Bell Pushbutton (Items 1 and 28, Fig. 3), Movement of the **Throttle**, **Reverse** or **Braking** handle (Item 21, Fig. 3) and Independent Brake Bail (Item 25 or 27, Fig. 3).



Cold Engine

The Cold Engine alarm is activated when the engine is started and the temperature is below the setpoint. The alarm is reset when the temperature rises above the setpoint. The alarm is also reset when the engine is stopped and the temperature is below the setpoint. The alarm is also reset when the engine is started and the temperature is above the setpoint.

OPERATING PROCEDURES

ON POWER-UP

NOTE: See TABLES 1 and 2 (IFD Screen Flow Chart and Tree) as aids in understanding IFD operation.

On Power-up, display screens will not appear for 10 to 30 seconds. The Operation Main Operating Screen (000 000, Fig. 35) will be displayed on both IFDs.

OPERATION SCREEN

NOTE: See TABLES 1 and 2 (IFD Screen Flow Chart and Tree) as aids in understanding IFD operation.

This screen (see Fig. 35) is used to monitor locomotive performance. After the locomotive computers have been powered-up and are operating normally, the Top Level Screen 000 000 will appear on the IFD and the message line will display any IFC or CAB Operator messages. Six functions are available in Level 1:

1. Operator Functions (Key Position F3).
2. Show More (Key Position F4).
3. Go Back (Key Position F5).
4. Reset Faults (Key Position F6).
5. Screen Controls (Key Position F7).
6. System Test (Key Position F8).

Operator Functions

Pressing this key will display screen 300 000. Refer to pertinent sections of this Manual following **Operating Procedures** for operation and screen examples. Six keys are active on this screen:

1. Distance Counter

Pressing Key Position F1, **Distance Counter**, will display screen 310 000. Six keys are active on this screen:

1. Count Up (Key Position F1).
2. Count Down (Key Position F2).
3. Stop Counter (Key Position F3).
4. Zero Counter (Key Position F4).
5. Preset Counter (Key Position F5).
6. Exit (Key Position F8).

2. Air Brake Setup

Pressing Key Position F2, **Air Brake Setup**, will display screen 320 000. Seven keys are active on this screen:

1. "Up Arrow" – increase feed valve setting (Key Position F1).
2. "Down Arrow" – decrease feed valve setting (Key Position F2).
3. Cut In/Cut Out – toggle Automatic Brake (Key Position F3).
4. Lead/Tail – toggle Independent Brake (Key Position F4).
5. Remote Session (Key Position F6).
6. Save Setup (Key Position F7).
7. Exit (Key Position F8).

3. End Of Train Setup

Pressing Key Position F3, **EOT Setup**, will display screen 332 000. Eight keys are active on this screen:

1. Select EOT Code (Key Positions F1–5).
2. Enter Code (Key Position F6).
3. Arm Two Way (Key Position F7).
4. Exit (Key Position F8).

4. Speed Control

Pressing Key Position F5, **Speed Control**, will display screen 350 000 – Manual Power Reduction. Seven keys are active on this screen:

1. On/Off (Key Position F1).
2. Manual/Auto (Key Position F2).
3. "Down Arrow" – set speed (Key Position F4).
4. "Up Arrow" – set speed (Key Position F5).
5. "Down Arrow" – set notch power % (Key Position F6).
6. "Up Arrow" – set notch power % (Key Position F7).
7. Exit (Key Position F8).

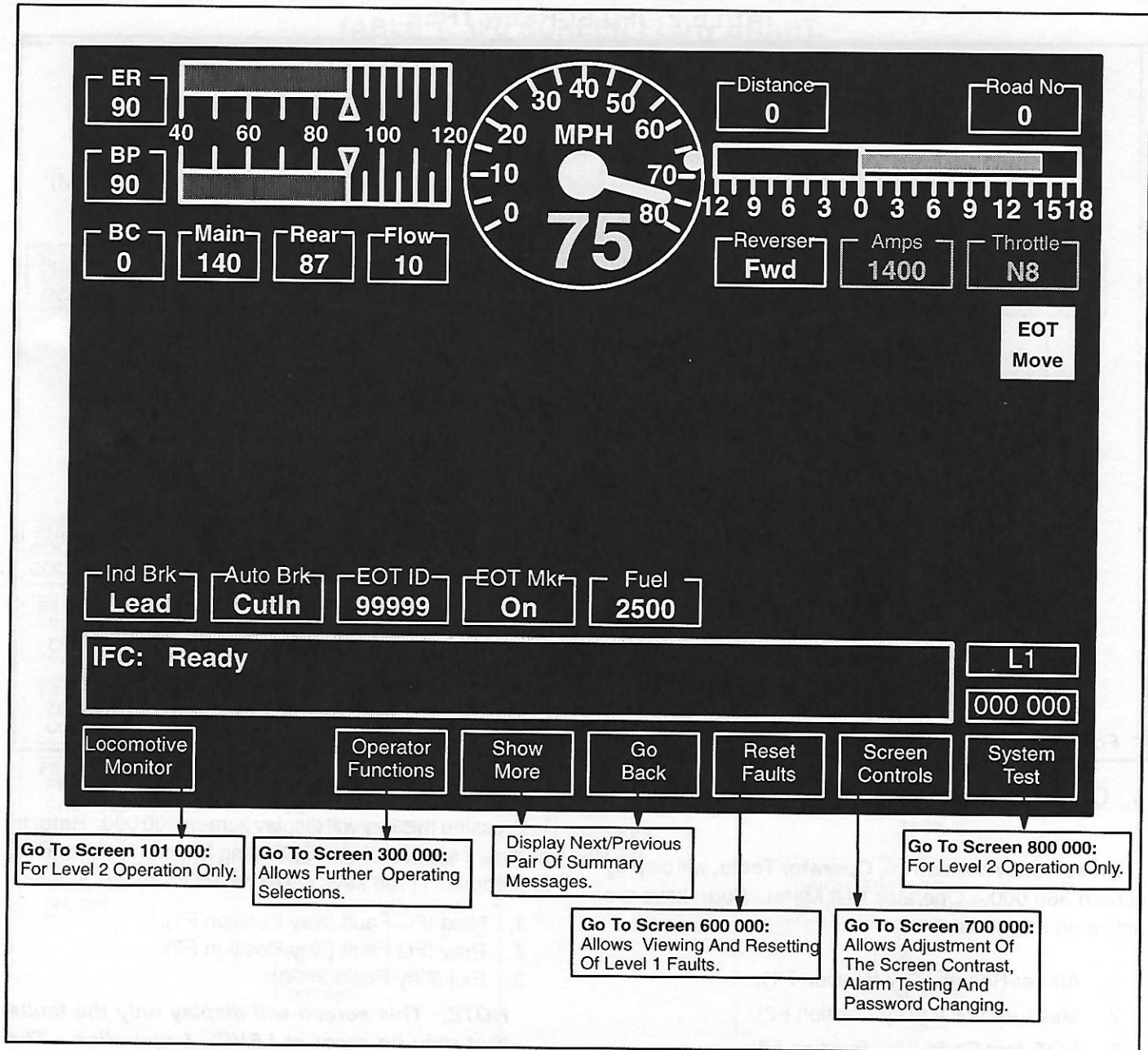


FIG. 35. MAIN OPERATION SCREEN (000 000). E-42510A.

4. Enter Password (Key Position F7).
5. Exit (Key Position F8).

NOTE: All data is still displayed and updated on the display screen while the operator is adjusting screen parameters.

System Test

Pressing this key will display screen 800 000. This key is active if, and only if, the IFC system is set to LEVEL 2 operation.

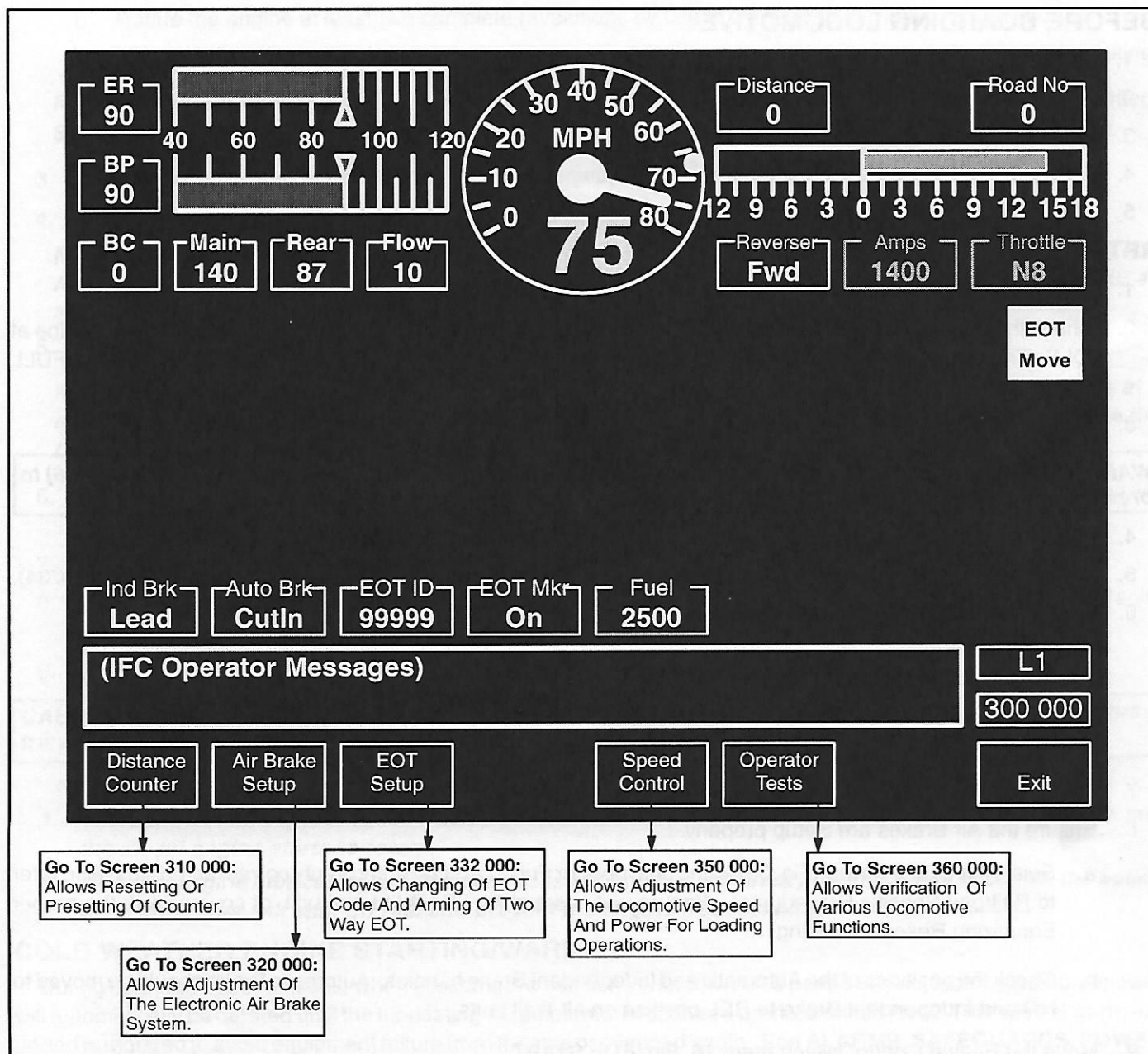


FIG. 36. OPERATOR FUNCTION SCREEN (300 000). E-42511A.

PREPARATION FOR OPERATION

The following checks and inspections should be made in accordance with railroad rules and regulations:

WARNING: STOPPING HAZARD. Under no circumstances should a train be permitted to continue in operation if the brake pipe air pressure falls below 45 psi. If this situation occurs, the train must be stopped and the brake pipe recharged to the railroad particular setting. Failure to comply with this warning may result in the inability to control or stop the train.

BEFORE BOARDING LOCOMOTIVE

1. Inspect for broken, worn, loose or dragging parts (brake rigging, brake shoes, wheels, covers, etc.).
2. Check for leaks from outside piping.
3. Properly position all drain and cut-out cocks.
4. Check the proper connections for air hoses and jumper cables (if in multiple with other units).
5. Check the fuel supply on the fuel tank sight glass (Fig. 31).

AFTER BOARDING LOCOMOTIVE

1. WITH ENGINE SHUTDOWN, remove rags, tools, etc., from moving parts and electrical equipment.
2. Check the diesel engine lubricating-oil supply. Oil level should indicate FULL on the dipstick with the engine at IDLE. The dipstick is located on the side of the engine near the lubricating-oil fill and is marked LOW and FULL (Fig. 30).
3. Check the air compressor lubricating-oil level.

WARNING: While servicing the air compressor, open Local Control Circuit Breaker (LCCB, Item 13, Fig. 6) to prevent air compressor motor from starting.

4. Check the cooling water supply (Fig. 29). Ensure the water drain valve is closed.
5. Check that the engine barring-over device is removed from the engine and cover is mounted in place (Fig. 34).
6. Check that the following air cut-out cocks are:
 - a. Air Compressor Governor Switch and Magnet Valve (Item 5, Fig. 26); open.
 - b. Control Air Drain (Item 6, Fig. 14); closed.
 - c. Control Air Supply, Horn and Window Wiper/Bell (Item 5, Fig. 14); open.
 - d. Bell; open.
7. Check that the brake-pipe cocks are properly positioned.
8. Ensure the Air Brakes are Setup properly.
 - a. Select **Air Brake Setup** (Fig. 36) found on Operator Function screen and verify correct unit status (also refer to Railroad Specific Procedures). Ensure unit is setup for LEAD (if Lead unit, of course) with the proper Equalizing Reservoir setting.
 - b. Check the positions of the Automatic and Independent Brake handles. Automatic Brake should be moved to HO and Independent Brake to REL position on all Trail units.
9. Move the Engine Control switch (Item 16, Fig. 6) to START.
10. Properly position the MU Headlight Selector switch (Item 17, Fig. 6).
11. Check that the **Throttle** Handle is in IDLE and the **Reverse** Handle is in OFF.
12. Ensure the dead-engine cock is closed (Item 4, Fig. 14) (cut-out).
13. Verify fuel supply reading from the fuel tank gage with the fuel gage reading on the IFD screen.

STARTING ENGINE

1. Perform operations as in **Before Boarding Locomotive and After Boarding Locomotive** sections listed previously.
2. If the engine has been stopped for a considerable period of time, or if a quantity of rain has entered the stack, before starting the engine the cylinders should be cleared of fuel or water accumulation. Proceed as follows:
 - a. Apply the engine barring-over device, and back off the compression relief plugs on the left side of each cylinder.

- b. Rotate the engine at least two complete revolutions by use of the engine barring-over device.
- c. Remove the barring-over device from the engine, and tighten all compression relief plugs before cranking.

NOTE: Cover for barring-over feature must be securely mounted, otherwise engine cannot be cranked. See Barring-Over Switch paragraph in the ALARMS AND SAFEGUARDS section of this publication.

3. Close the Battery switch located behind the door under the EC panel (Item 13, Fig. 18).
4. Turn ON all applicable circuit breakers in the top row of breakers on the EC panel (Fig. 6).

NOTE: On Power-up, ensure the Air Brake Computer circuit breaker on the EC Panel (Item 8, Fig. 6) is ON. A Power Up Penalty might occur. Simply move the brake handle to SUPPRESSION and hold for THE 40 second internal boot plus ten seconds, then return handle to RELEASE.

5. Turn ON **ALL** circuit breakers in the second row of breakers on the EC panel (Fig. 6).

NOTE: When starting engines of several locomotives in a multiple-unit consist, start engines one at a time. Close the Control circuit breaker only on one unit at a time. When all engines are running, close the Control circuit breaker on the Lead unit only, open all others.

6. Check the Diagnostic Display and/or IFDs for any fault messages. If the display says "Won't Crank," the unit will not attempt to crank.
7. Verify the Engine Control (EC) switch in the START position.
8. At the Start Station (Fig. 28), located near the engine, turn the Start switch to the PRIME position. Hold until solid fuel flow with no bubbles shows in the sight glass.
9. Turn the switch to the START position and hold until the engine starts.

CAUTION: Do not discharge the battery excessively by repeated attempts to start. If the first two or three tries are unsuccessful, recheck the starting procedure.

NOTE: On start-up, note the following:

1. There will be a two to four second delay between the time the switch is placed in the START position and the diesel engine starts to rotate.
2. If proper engine lubricating-oil pressure does not build up within approximately 40 seconds, the solid-state controller will shut off fuel and prevent the engine from running.

COLD WEATHER ENGINE STARTING/WARM-UP

During cold weather conditions, when a locomotive has been shutdown for a period of time, locomotive horsepower will automatically be derated until the lubricating oil temperature reaches a predetermined level. This special warm-up period is required to avoid equipment failure from thermal or overload strain. See **ALARMS, SAFEGUARDS, POWER DERATIONS AND SHUTDOWNS** section of this manual.

FASTER AIR PUMPING

To provide faster air pumping on locomotive, when reservoirs have been drained or after the locomotive has been coupled to a train, proceed as follows:

1. Leave the Generator Field circuit breaker in the OFF position (Item 12, Fig. 3).
2. Close the Control breaker on the Control Stand (Item 13, Fig. 3).
3. Insert the **Reverse** Handle (place in center OFF position).
4. Move the **Throttle** Handle to Notch 1. The air compressor speed is twice engine speed when the engine speed is below 525 RPM.

NOTE: If the main reservoir air pressure is above 130 psi (896 kPa) and is not rising, increasing the engine speed will not raise the pressure.

BEFORE MOVING LOCOMOTIVE

1. Check the Diagnostic Display panel and/or IFDs for any fault messages. It should say "Ready."
2. Check the main reservoir air pressure according to railroad rules and regulations.
3. Check the control air pressure. Normal pressure is 80 psi (551 kPa).
4. Make an Independent air brake application. Release the parking brake and remove any blocking of the wheels.
5. Allow time for the engine cooling water to warm up before moving the locomotive *in accordance with Railroad Rules and Regulations*. Also review **ALARMS, SAFEGUARDS, POWER DERATIONS AND SHUTDOWNS** Section of this manual.
6. Ensure End Of Train function is properly set. Select **EOT Setup** (Fig. 36) found on Operator Function screen and follow instructions.
7. Make sure the throttle and reverser are centered and turn the Engine Control switch to RUN.

WARNING: STOPPING HAZARD. Prior to train movement, Brake application/release and leakage tests **MUST BE** performed at the Railroad specified brake pipe pressure for the entire train. The brake pipe line is to be open throughout the train. Leakage observed and noted **MUST BE** within the specified permissible limit of five psi per minute*. Once the acceptable leakage rate is obtained, **NO MANUAL ADJUSTMENTS** are to be made to alter the running brake pipe pressure setting while the train is at the terminal and standing still. Failure to comply with this procedure could result in the inability to control or stop the train.

8. Perform an Air Brake Departure Test in accordance with *Railroad Specific Procedures*.
9. Optional **Brake Pipe Leakage Test** for use without airflow indicator/gage test method; proceed as follows:
 - a. With the brake system fully charged and with the IFD **Air Brake Setup** screen showing LEAD/CUT-IN, move the Automatic Brake handle promptly toward the FULL position until the equalizing reservoir pressure has been reduced by 15 psi (as noted on the display screen); then stop and leave the handle in this position.
 - b. As soon as the brake-pipe pressure has reduced to the level of the equalizing reservoir pressure (continuous blow from brake-valve exhaust), change the screen to the CUT-OUT position. Immediately observe the Brake-pipe gage on the IFD and time the pressure drop *in accordance with Railroad Rules and Regulations*.
 - c. At the completion of the brake-pipe leakage test, move the Automatic Brake handle further toward the FULL position, and reduce the equalizing reservoir pressure slightly (two psi) below the brake-pipe pressure (watch the decrease on IFD screen). The brake may later be released by returning the Automatic Brake handle to the RELEASE position. Return the system to the LEAD/CUT IN Mode.
10. If **Dead Heading (Dead-in-train)**, proceed as follows:
 - a. Place the Independent Brake handle in the RELEASE position and the Automatic Brake handle in the HANDLE OFF (HO) position.
 - b. If functional, set the **Air Brake Setup** screen to TRAIL/CUT- OUT position.

CAUTION: To avoid wheel flats, drain main reservoir of unit to less than 25 psi (172 kPa).

- c. Open LEB Computer and Air Brake Computer circuit breakers (Items 3 and 10, Fig. 6) and tag.
- d. Set the dead-engine cock found on GE Harris CCBII EPCU (Item 4, Fig. 14) to IN.
- e. Connect only the brake-pipe hoses on either end of the locomotive.

* CFR 49, PARTS 232.10 (i) (2), 232.11 (b) (1), 232.11 (e) and 232.13 (d) (1).

11. The train is now ready for operation. Perform the following OPERATING PROCEDURES.

NOTE: *If you lose power to the GE Harris CCBII system, the following occurs:*

1. *The Alarm Bell will ring. The Alarm Bell may be silenced locally.*
2. *The PCS will open interrupting locomotive power. Dynamic Brake operation will be affected per Railroad Procedures.*
3. *The locomotive will go into a PENALTY BRAKE situation and Brake Cylinder pressure will develop to 60 psi.*
4. *Independent Brake control will NOT function. Bail Off of the locomotive will be affected per Railroad Procedures.*
5. *The operator may reset the failure by toggling the LEB Computer and Air Brake Computer circuit breakers on the EC Panel (Items 3 and 10, Fig. 6). See Table 3 in the Electronic Air Brake section for more information.*
6. *If unit is a Trail Unit, also note the following:*
 - a. *Bail-off is still permitted with reapplication limited to further reductions in brake pipe pressure.*
 - b. *There will be no change in air brake, power or dynamic brake conditions.*
 - c. *Independent Brake will apply and release when commanded by the LEAD unit (limited to the A&R pipe pressure).*

WARNING: STOPPING HAZARD. *If internal power loss and Locomotive battery power loss to the GE Harris CCBII System occurs while train is in motion, a Brake application is made at a SERVICE rate (BP goes to below 15 psi). Operator may initiate an EMERGENCY Brake application from the EMERGENCY BRAKE VALVE located on the Crew Member's Desk or the Operator's BRAKE VALVE – Includes a pneumatic backup for EMERGENCY initiation.*

WARNING: STOPPING HAZARD. *Following an EMERGENCY BRAKE application, if the train is not at rest, brake release MUST NOT be attempted. Any movement of the AUTOMATIC Brake Handle to RELEASE while train is moving may cause equipment and/or personnel damage.*

OPERATING PROCEDURES

MOVING A TRAIN

1. Close the Generator Field circuit breaker (Item 12, Fig. 3).
2. Move the **Reverse** Handle to the desired direction of movement.
3. Release the brakes completely.
4. Advance the **Throttle** Handle. The **Throttle** Handle has notches (IDLE up to Notch 8), with each successive notch representing an increase in power, or locomotive tractive effort.

Starting a train depends on type, length, weight, grade, condition of rail and amount of slack in the train. This locomotive is designed to have easily controlled tractive effort build-up characteristics, with the tractive effort in each notch limited to definite values as the **Throttle** Handle is moved from the lowest to the highest notch. The engineer can easily control the amount of tractive effort required to start and accelerate a particular train. Speed can be controlled as desired by reducing or increasing the **Throttle** Handle position.

STOPPING A TRAIN

Move the **Throttle** Handle to IDLE, and apply the dynamic or air brakes according to railroad regulations. Also see **Applying Dynamic Brakes** found later in this section of the manual. If leaving the engineer's position after the train has stopped, move the **Reverse** Handle to OFF.

CAUTION: *The control system of this locomotive will delay application of dynamic braking. If however, other locomotives in the consist do not have this feature, to prevent equipment damage when changing from power to dynamic braking or from dynamic braking to power, pause 10 seconds with the Throttle Handle at IDLE.*

REVERSING LOCOMOTIVE

1. Bring the locomotive to a full stop.
2. Move the **Reverse** Handle to the opposite direction.
3. Release the brakes.
4. Advance the **Throttle** Handle.

PASSING THROUGH WATER

Do not exceed two or three MPH if there is water over the rails. Do not pass through water that is over 2.5 in. (63,5 mm) above the top of the rail.

PASSING OVER RAILROAD CROSSINGS

Do not pass over railroad crossings at full power – traction motor damage may result. While all units are passing over the crossing, reduce power by moving the **Throttle** Handle to Notch 5, or below.

STOPPING ENGINE

1. Move the **Throttle** Handle to IDLE.

CAUTION: *After a locomotive has operated at full load, allow the engine to run at IDLE for at least five minutes before shutting down. Otherwise, immediate shutdown after such operation could be harmful to some engine components.*

2. Open the Generator Field circuit breaker (Item 12, Fig. 3).
3. Move the Engine Control switch (Item 16, Fig. 6) to START.
4. Press the Engine Stop pushbutton on the Engine Control panel or at the Engine Start Station (Item 7, Fig. 6; Fig. 28).
5. Secure the locomotive in accordance with railroad rules and procedures.

BEFORE LEAVING LOCOMOTIVE

1. Apply the parking brake and release the air brakes after uncoupling from the train.

NOTE: *Hand brake is located on the Radiator Cab (Item 25, Fig. 2).*

2. Leave the **Throttle** Handle in IDLE.
3. Close the windows and doors.
4. Open all switches and circuit breakers as described in **Control Stand Equipment** and **Engine Control Panel** paragraphs located in the **OPERATING CONTROLS** section of this manual.
5. Open the Battery switch (Item 13, Fig. 18).
6. In freezing weather, precautions must be taken to see that the cooling water does not freeze. See **Draining Cooling Water System** paragraph found in the **OTHER EQUIPMENT** section of this manual, and follow railroad rules for this situation.

SAFETY CONTROLS

After a Penalty brake application has occurred, normal locomotive operation is restored in the following manner:

1. Move the **Throttle** Handle to IDLE.
2. Move the Automatic Brake handle to SUPPRESSION.

3. Wait at least 10 seconds, then move the Automatic Brake handle to RELEASE when ready.

DYNAMIC BRAKE OPERATION

Dynamic braking is applied to the locomotive only, not to the train.

Applying Dynamic Brakes

Applying dynamic braking is done in the following manner:

NOTE: *Dynamic braking is dropped when locomotive speed falls below five MPH and is not available again until after eight MPH.*

1. Move **Throttle** Handle to IDLE.
2. Move the **Braking** Handle to SET-UP position; pause, then advance the handle into the BRAKING sector as desired.
3. After the slack is bunched, manipulate the **Braking** Handle until the desired braking effort is obtained. Observe and correct braking effort during the initial period of Dynamic Brake application.

The amount of braking effort obtainable varies with the position of the **Braking** Handle for various speeds. Maximum braking effort is obtained in the FULL BRAKING position at 25 MPH.

NOTE: *Wheelslip warning may occur while in dynamic braking. This indicates wheels are sliding. Sand is applied automatically to the wheels of the sliding unit. Until the warning stops, reduce the Braking Handle position.*

Use Of Air Brakes During Dynamic Braking

NOTE: *When independent brake is applied, dynamic braking effort is decreased. The amount of reduction depends on locomotive speed. At 25 MPH (approximately) or above there is no decrease in braking effort. Below 25 MPH dynamic braking effort is reduced as locomotive speed is reduced to a minimum dynamic braking effort at 0 MPH.*

When necessary, the automatic air brake may be used in conjunction with the dynamic brake. Automatic air brakes will apply on the train but not on the locomotive.

When dynamic braking is being used, the GE Harris CCBII System nullifies an Automatic air brake application on the locomotives (Item 4, Fig. 14). This same interlock will prevent reapplication of the automatic brake on the locomotive after release of the dynamic brake.

Release Of Dynamic Braking

Release dynamic braking by moving the **Dynamic Brake** Handle to the OFF position.

OPERATING AS A LEADING UNIT

To operate the locomotive as a Lead unit of a consist, first make the necessary preliminary preparations for operation listed in **Preparation For Operation** located earlier in this section of the manual, then proceed as follows:

NOTE: *Refer to ELECTRONIC AIR BRAKE section of this manual for Air Brake Setup if more information is needed.*

Air Equipment Set-Up

1. Move the Automatic Brake handle to the HANDLE OFF (HO) position.
2. Move the Independent Brake handle to the FULL APPLICATION position.
3. Change Brake Setup to LEAD (if necessary).
4. Test the air brake in accordance with Railroad Rules.

Electrical Set-Up

1. Close the Generator Field and Control circuit breakers (Items 12 and 13, Fig. 3). (The Control circuit breaker must be closed on the Lead unit only.)

2. Close the Dynamic Brake circuit breaker (Item 14, Fig. 3).
3. Close the Engine Run circuit breaker (Item 11, Fig. 3). (This circuit breaker must be closed on the Lead unit only.)
4. Close all circuit breakers on the Engine Control (EC) panel (Fig. 6).
5. Move the MU Headlight Set-Up switch to the required position (Item 17, Fig. 6).
6. Insert the **Reverse** Handle into the Controller and move to the desired direction.
7. Operate the locomotive in accordance with operating procedure.

OPERATING AS A TRAILING UNIT

NOTE: Refer to **ELECTRONIC AIR BRAKE** section of this manual for Air Brake Setup if more information is needed.

Air Equipment Set-up

1. Make a Full Service application with the Automatic Brake Valve handle.
2. Change Brake Setup to TRAIL (if necessary).
3. Move the Automatic Brake handle to the HANDLE OFF (HO) position.
4. Place the Independent Brake handle in the RELEASE position.

Electrical Set-Up

1. Move the **Reverse** Handle to OFF and remove the handle.
2. Open the Engine Run, Generator Field, Control and Dynamic Brake circuit breakers on the control stand (Items 11, 12, 13 and 14, Fig. 3).
3. The Circuit Breakers 4 through 8 in the top row on the Engine Control (EC) panel can be turned OFF for Trail operation. If locomotive is not operating in Distributed Power, Circuit Breakers 1 and 2 can be turned OFF. The second row of breakers, and Circuit Breaker 3 in top row, **MUST BE ON** for Trail operation. The Running Lights circuit breaker may be positioned as desired (Fig. 6).
4. Place the MU Headlight Set-Up switch in the proper position (Item 17, Fig. 6).

CHANGING OPERATING ENDS

To change operating control from the cab of one locomotive unit to the cab of another, proceed as follows:

Vacating Unit – Air Equipment Set-Up

1. Make a Full Service brake pipe reduction.
2. Allow time for all air blowing sounds to stop (IFD ER gage will read 60–64 psi); then go to IFD **Air Brake Setup** screen and set for TRAIL/CUT-OUT.
3. Place the Automatic Brake handle in the HANDLE OFF position and the Independent Brake handle in the RELEASE position.
4. Disarm End Of Train function. Select **EOT Setup** (Fig. 36) found on Operator Function screen and follow instructions.

Vacating Unit – Electrical Set-Up

1. Move the **Reverse** Handle to OFF and remove the handle.
2. Open the Engine Run, Generator Field, Control and Dynamic Brake circuit breakers on the control stand (Items 11, 12, 13 and 14, Fig. 3).
3. The Circuit Breakers 4 through 8 in the top row on the Engine Control (EC) panel can be turned OFF for Trail operation. If locomotive is not operating in Distributed Power, Circuit Breakers 1 and 2 can be turned OFF. The second row of breakers, and Circuit Breaker 3 in top row, **MUST BE ON** for Trail operation. The Running Lights circuit breaker may be positioned as desired (Fig. 6).

4. Place the MU Headlight Set-Up switch in the proper position (Item 17, Fig. 6).

Operating Unit – Air and Electrical Equipment Set-Up

Set-Up the air brakes and electrical equipment on the operating unit as described in **Operating As a Leading Unit** “Air Equipment Set-Up” and “Electrical Equipment Set-Up” paragraphs found in this section of the manual.

TO OPERATE WITH OTHER TYPES OF UNITS

This locomotive is equipped with a traction motor thermal simulator which computes traction motor temperatures. This simulator will reduce locomotive output as required to protect the traction motors.

If the units in the locomotive consist are geared for differing maximum speeds, do not run at speeds in excess of that recommended for the unit having the lowest maximum permissible speed.

Similarly, do not operate at low speeds long enough to exceed the specified traction motor ratings on any of the units in the locomotive consist. A locomotive with high horsepower per axle will develop more tractive effort at any given speed than will units of lower horsepower per axle and will, therefore, tend to overload sooner at lower speed.

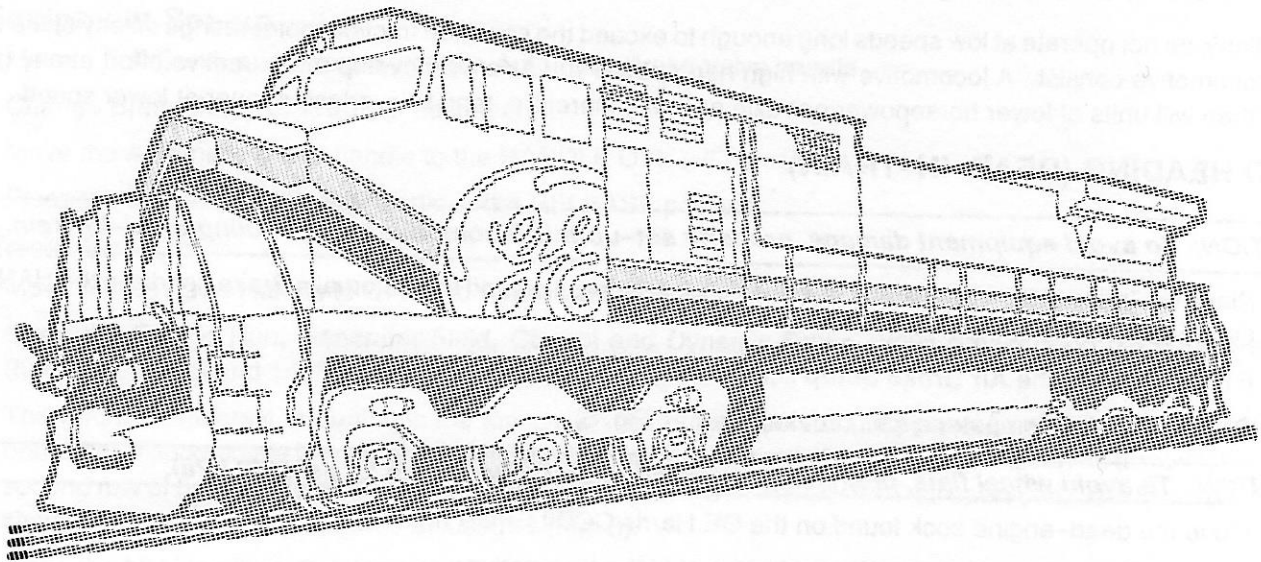
DEAD HEADING (DEAD-IN-TRAIN)

CAUTION: To avoid equipment damage, properly set-up this locomotive when hauling dead-in-train.

1. Place the Independent Brake handle in the RELEASE position and the Automatic Brake handle in the HANDLE OFF position.
2. If functional, set the **Air Brake Setup** screen to TRAIL/CUT-OUT position.
3. Open Air Brake Computer circuit breaker (Item 8, Fig. 6).

CAUTION: To avoid wheel flats, drain main reservoir of unit to less than 25 psi (172 kPa).

4. Move the dead-engine cock found on the GE Harris CCBII EPCU (Item 4, Fig. 14) to IN.
5. Connect the brake-pipe hoses(s) on either end of the locomotive.



LOCOMOTIVE OPERATION BY IFD SCREEN

The following sections of this Operating Manual are presented in order of the Main Operation Screen (000 000, Fig. 35) and Operator Function Screen (300 000, Fig. 36) soft keys. Each section starts on an ODD page with a title page to enable the operator to find the needed section easily.

NOTE: *For operation of the Dash 9-40W locomotive, note the following:*

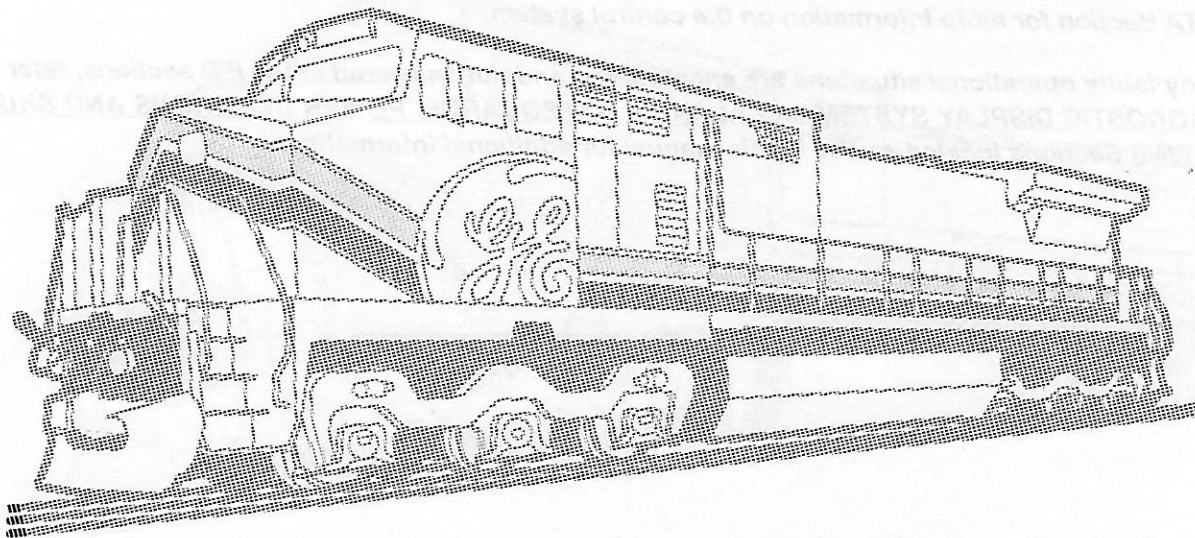
1. *See TABLES 1 and 2 (IFD Screen Flow Chart and IFD Screen Tree) located in OPERATING PROCEDURES Section of this publication as aids in understanding IFD operation. The Flow Chart is also located on the back cover of this manual for fast operator location.*
2. *Refer to INTRODUCTION TO INTEGRATED FUNCTION CONTROL AND GENERAL LOCOMOTIVE DATA Section for more information on the control system.*
3. *If any faulty operational situations are encountered and not answered in the IFD sections, refer to DIAGNOSTIC DISPLAY SYSTEM and ALARMS, SAFEGUARDS, POWER DERATIONS AND SHUT-DOWNS Sections located earlier in this manual for additional information.*

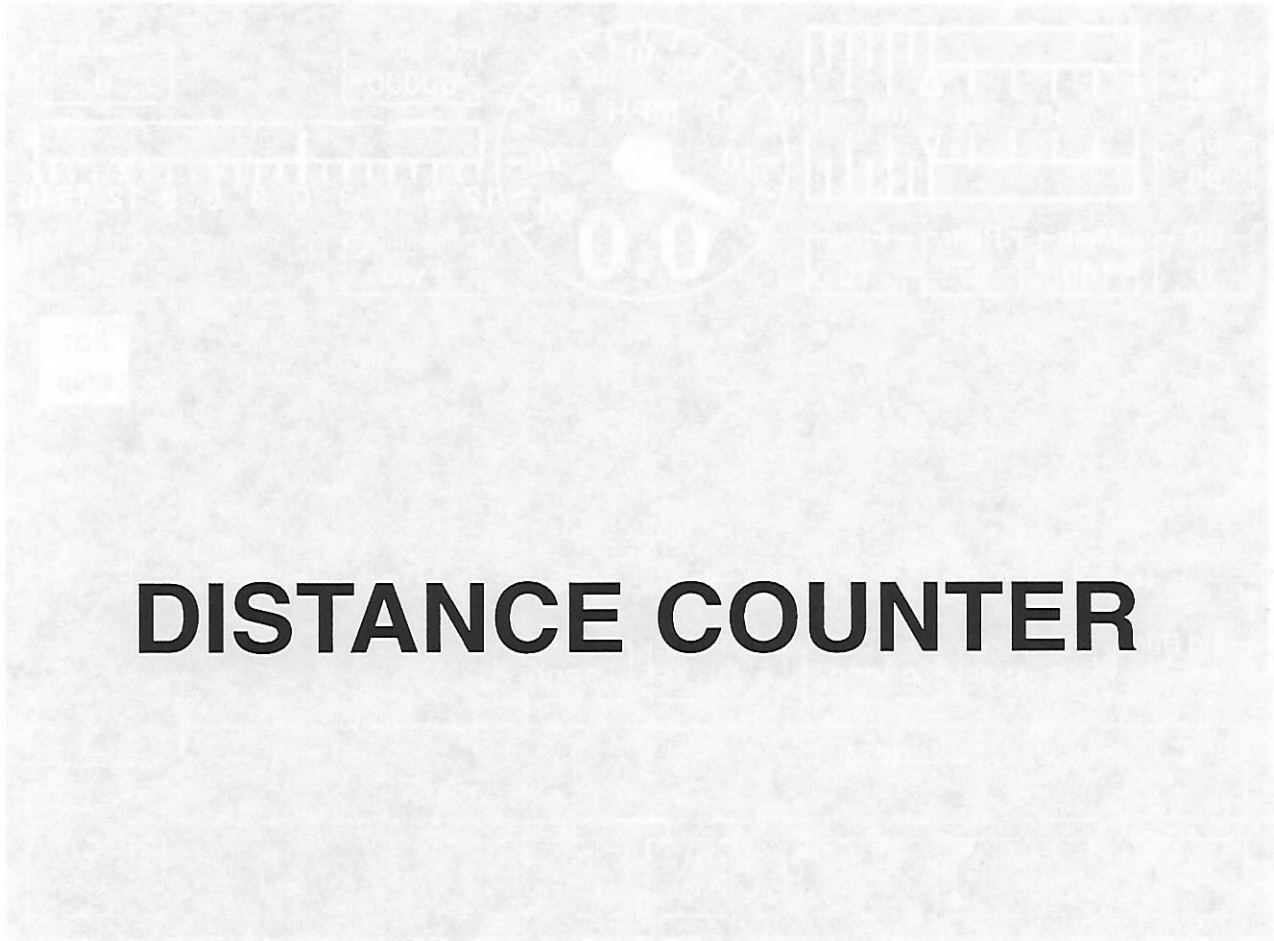
LOCOMOTIVE OPERATION BY IFD SCREEN

The following sections of the Operating Manual are presented in order of the Main Operation Screen (000 000). Fig. 35 and Fig. 36 are presented in order of the Main Operation Screen (000 000). Each section starts on an ODD page with a title page to enable the operator to find the needed section easily.

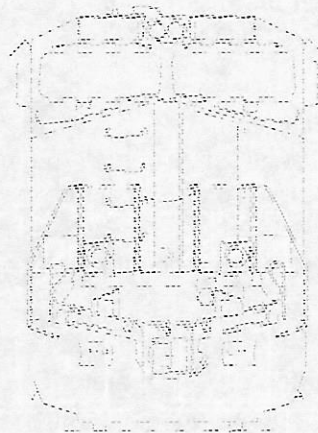
NOTE: For operation of the Dash 8-40W locomotive, note the following:

1. See TABLES 1 and 2 IFD Screen Flow Chart and 1-D Screen Flow Chart located in OPERATING PROCEDURE section of this publication as this is understanding IFD operation. The Flow Chart is also located on the back cover of this manual for fast operator location.
2. Refer to INTRODUCTION TO INTEGRATED FUNCTION CONTROL AND GENERAL LOCOMOTIVE DATA section for basic information on the control system.
3. If any faulty operational situation occurs, refer to DIAGNOSTIC DISPLAY SYSTEM section for further information.





DISTANCE COUNTER



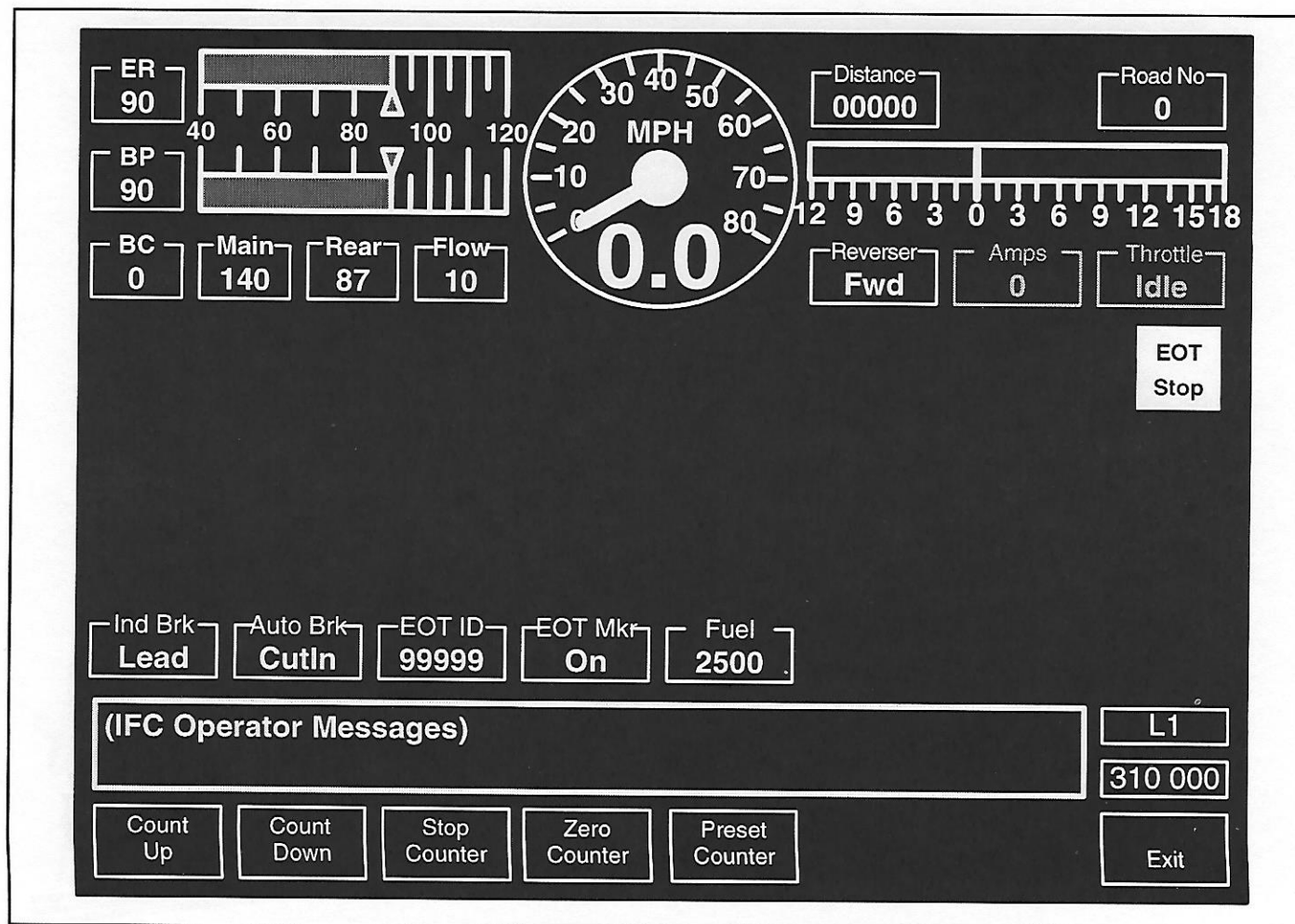


FIG. 37. DISTANCE COUNTER SCREEN (310 000). E-42512A.

NOTE: IFD screen layout is customer specific. Customer equipment requirements often differ from one railroad to another; therefore, screen illustrations and documentation may not entirely agree with the equipment furnished to any particular railroad.

INTRODUCTION

The Distance travelled (Fig. 37) function receives data from the motor tachometers to show distance travelled in feet. This function allows the Crew to set, reset or preset the counter for trip information. The counter operates independently from the counter on the other IFD. The counter counts "up" when the locomotive is moving short-hood forward and "down" when the locomotive is in reverse unless changed through use of screen keys.

OPERATION

Pressing key position F1, **Distance Counter**, on the Operator Function Screen (screen 300 000, see Fig. 36) will display screen 310 000. Follow Railroad procedures for this operation. The active keys and a brief description of operation are as follows:

1. Press key position F1 (**Count Up**) will start the counter from the current setting forward. The present locomotive direction will be considered forward.
2. Press key position F2 (**Count Down**) will start the counter from the current setting backward. The present locomotive direction will be considered forward.

3. Press key position F3 (**Stop Counter**) will stop the counter at the present reading. This key is not active until counter is active.
4. Press key position F4 (**Zero Counter**) will set the counter to zero.
5. Press key position F5 (**Preset Counter**) will display screen 315 000. **Note: This key is only active if the counter is stopped.**
 - a. Press key position F1 ("**UP**" Arrow) will increase the distance by 10,000 feet.
 - b. Press key position F2 ("**UP**" Arrow) will increase the distance by 1,000 feet.
 - c. Press key position F3 ("**UP**" Arrow) will increase the distance by 100 feet.
 - d. Press key position F4 ("**UP**" Arrow) will increase the distance by 10 feet.
 - e. Press key position F5 ("**UP**" Arrow) will increase the distance by 1 foot.
 - f. Press key position F6 (**Enter**) will exit the operator to screen 310 000 with the new preset distance.
 - g. Press key position F8 (**Exit**) will exit the operator to screen 310 000 with the old preset distance.
6. Pressing key position F8 (**Exit**) will return the operator to screen 300 000.

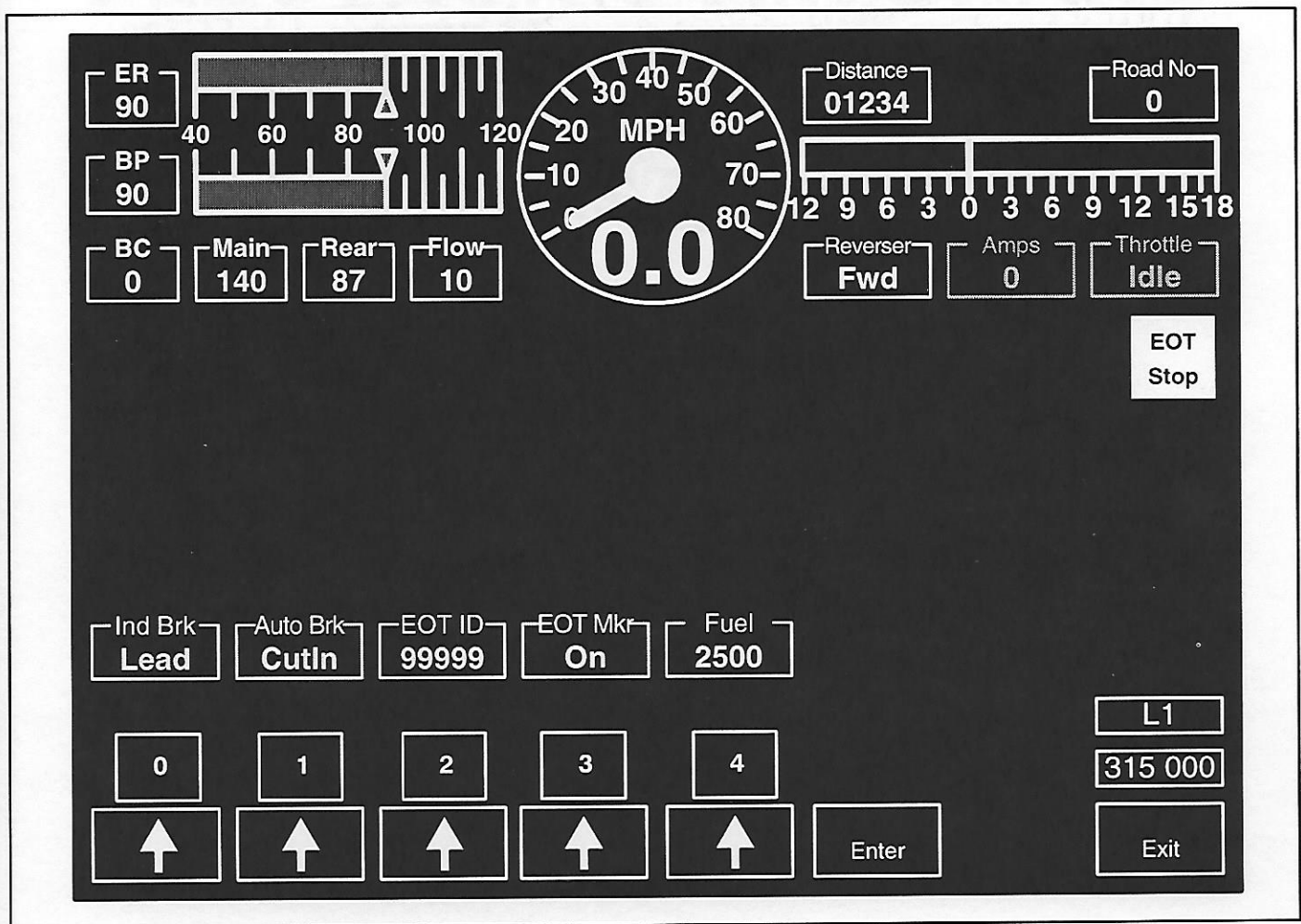
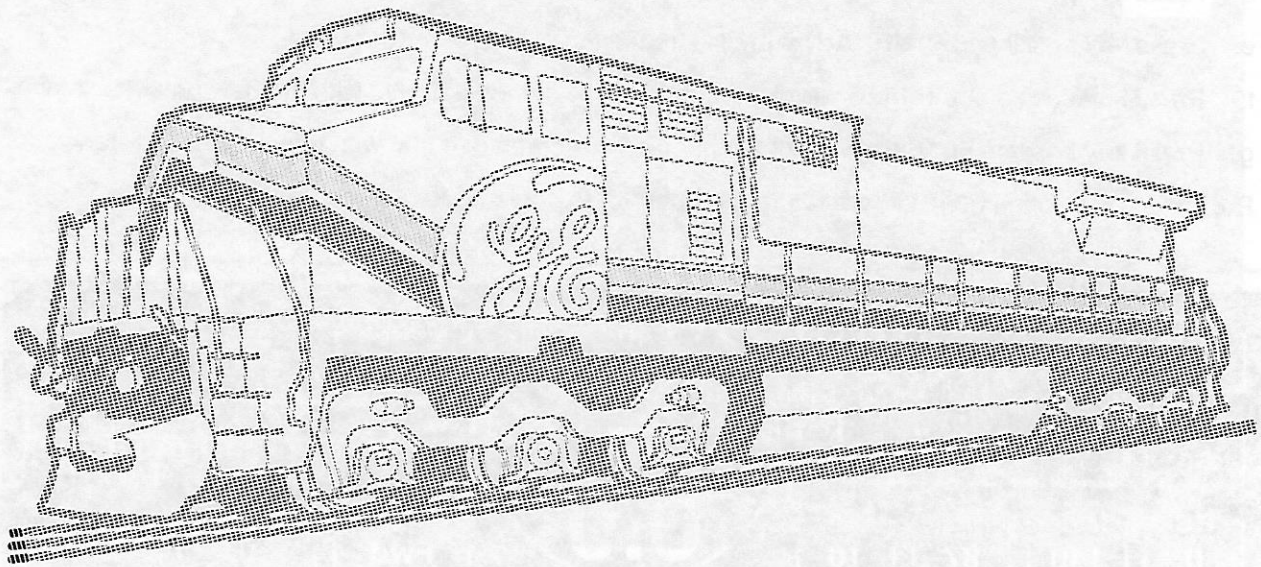
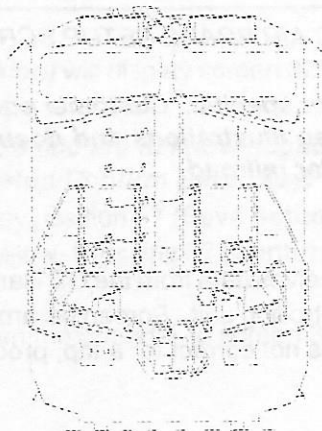


FIG. 38. DISTANCE COUNTER PRESET SCREEN (315 000). E-42513A.



ELECTRONIC AIR BRAKE



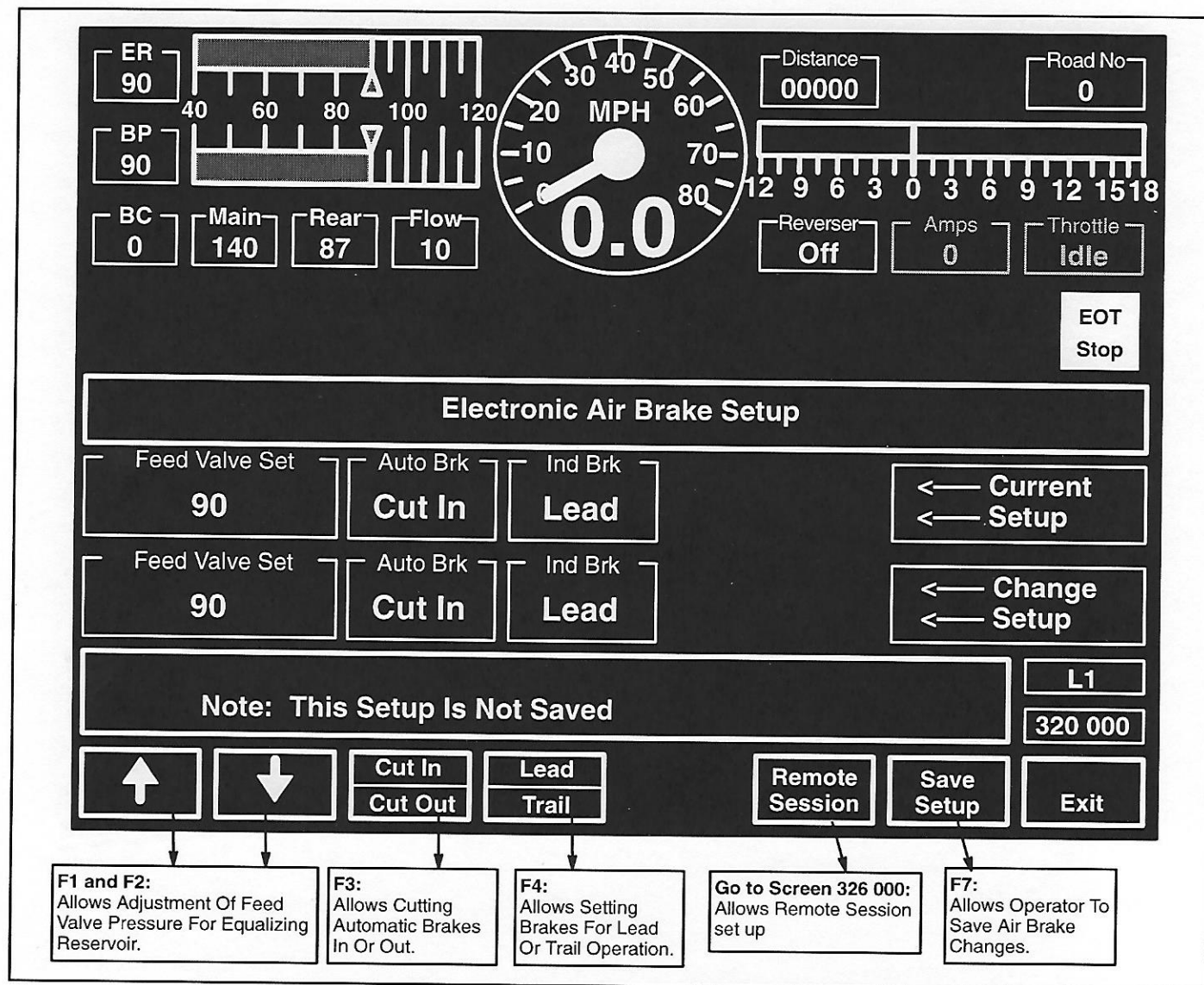


FIG. 39. ELECTRONIC AIR BRAKE SETUP SCREEN (320 000). E-43345.

NOTE: IFD screen layout is customer specific. Customer equipment requirements often differ from one railroad to another; therefore, screen illustrations and documentation may not entirely agree with the equipment furnished to any particular railroad.

INTRODUCTION

The Air Brake Setup (Fig. 39) function receives data from the GE Harris CCBII system. Operators use this screen to verify or adjust Air Brake settings of the controlling unit. Screen parameters may **not** be changed if the unit is moving (faster than 0.5 mph). If the current setup is not correct for a trip, proceed to the Operation Section that follows.

OPERATION

Pressing key position F2, **Air Brake Setup**, on the Operator Function Screen (screen 300 000, see Fig. 36) will display screen 320 000. Follow Railroad Procedures for this operation. The active keys and a brief description of operation are as follows:

1. Pressing key positions F1 and F2 ("**Up**" and "**Down**" Arrows) will allow adjustment of the Feed Valve pressure for the Equalizing Reservoir by 1 psi (7 kPa). The computer permitted range is 60 to 110 psi (413 to 758 kPa).

NOTE: The message line will change from “Press Keys To Change Air Brake Setup” to “Note: This Setup Is Not Saved” (message block and text will also turn yellow) as soon as one of the setup keys has been pressed. Also, if the unit speed is 0.5 mph or more or if the computer senses inactivity for more than three minutes, screen 320 000 will be displayed again with the original setup parameters.

2. Pressing key position F3 (**Cut In/Cut Out**) will toggle the displayed indicator. This key is only active if Ind Brake reads **Lead**.
3. Pressing key position F4 (**Lead/Trail**) will toggle the displayed indicator. Selecting **Trail** also selects **Cut Out**. When **Trail** is selected, key position F3 (**Cut In/Cut Out**) is not available.

NOTE: With **LEAD/CUT IN** combination, both markers and their respective text will remain white. With the **LEAD/CUT OUT** combination, **CUT OUT** marker and text will be yellow.

IMPORTANT – To avoid **EMERGENCY** brake application when changing from **TRAIL/CUT OUT** to **LEAD/CUT IN**, it is recommended to proceed as follows:

- Change screen parameters to **LEAD/CUT OUT**. The message line will change to read “Note: This Setup Is Not Saved” (message block and text will turn yellow). Key position F7 (**Save Setup**) will now appear also.
- Press key position F7 to save the setting. The message line will now read “Confirm Selection Before Saving” (message block and text remain yellow).
- Press F7 (**Confirm Save**) to save the change. The computer will exit screen 320 000 and display screen 300 000.
- Wait for the equalization of ER and BP on the screen.
- Press **Air Brake Setup** again to bring screen 320 000 to the display.
- Change screen parameter to **CUT IN**. The message line will change to read “Note: This Setup Is Not Saved” (message block and text will turn yellow). Key position F7 (**Save Setup**) will now appear also.
- Press key position F7 to save the setting. The message line will now read “Confirm Selection Before Saving” (message block and text remain yellow).
- Press F7 (**Confirm Save**) to save the change. The computer will exit screen 320 000 and display screen 300 000.

NOTE: Any attempt to change Air Brake Setup from **LEAD** to **TRAIL** while the **Reverse** handle is not centered will prompt the error message, “Reverser Must Be Centered For Trail” (message block and text will also turn yellow) for three seconds.

4. Pressing key position F6 (**Remote Session**) will display screen 326 000 (Fig. 40). This key is only active if the locomotive is stopped and BCP \geq 25 psi.

NOTE: No changes made on screen 320 000 are acknowledged by the Brake Computer until they have been saved (twice) using the “Saved Setup/Confirm Save” key.

5. Pressing any key (F1–F6) will activate key position F7 (**Save Setup**). Pressing F7 the first time will change key color to yellow and banner message to yellow. Pressing F7 (**Confirm Save**) again saves the new setup and exits to screen 300 000.
6. Pressing key position F8 (**Exit**) will return the operator to screen 300 000.

ELECTRONIC AIR BRAKE SET-UP, LEAD

To operate the locomotive as a Lead unit of a consist, set-up the air brakes as follows:

NOTE: *Ensure all other locomotives in the consist are set-up in Trail before attempting to set this locomotive to Lead.*

1. Ensure the **Throttle** handle is in IDLE, **Braking** handle is in OFF and the **Reverse** handle is centered.
2. Place the Automatic Brake handle in RELEASE (REL) and the Independent Brake handle in FULL APPLICATION (APPL).
3. Press key position F2, **Air Brake**, on the Operator Function Screen (screen 300 000, see Fig. 36) to display screen 320 000. See OPERATION this section of the Operating Manual.
4. Press key position F4 (**Lead**) to toggle the displayed Independent Brake indicator to Lead.
5. Press key F7 (**Save Setup/Confirm Save**) twice. Verify that the BC pressure increases.
6. Press key position F2 on screen 300 000 again. Use the keys F1 and F2 to adjust the Feed Valve Setting for the Equalizing Reservoir (ER) as required.
7. Ensure ER pressure is greater than BP pressure and press key F3 (**Cut In**) to cut in the Automatic Brake.
8. Press key F7 (**Save Setup/Confirm Save**) twice to save this set-up.
9. The Independent and Automatic Brakes are now cut in.

ELECTRONIC AIR BRAKE SET-UP, TRAIL

To operate the locomotive as a Trail unit of a consist, set-up the air brakes as follows:

1. Ensure the **Throttle** handle is in IDLE, **Braking** handle is in OFF and the **Reverse** handle is removed.
2. Move the Automatic Brake and Independent Brake handles to FULL SERVICE (FS) and FULL APPLICATION (APPL).
3. While the system is exhausting press key position F2, **Air Brake**, on the Operator Function Screen (screen 300 000, see Fig. 36) to display screen 320 000. See OPERATION this section of the Operating Manual.
4. After Brake Pipe exhaust ceases, place Independent Brake handle in RELEASE (REL).
5. Press key position F4 (**Trail**) to toggle the displayed Independent Brake indicator to Trail. Selecting **Trail** also selects **Cut Out** for the Automatic Brake. When **Trail** is selected, key position F3 (**Cut Out/Cut In**) is not available.
6. Press key F7 (**Save Setup/Confirm Save**) twice.
7. The Independent and Automatic Brakes are now cut out.
8. Place the Automatic Brake handle in HANDLE OFF (HO).

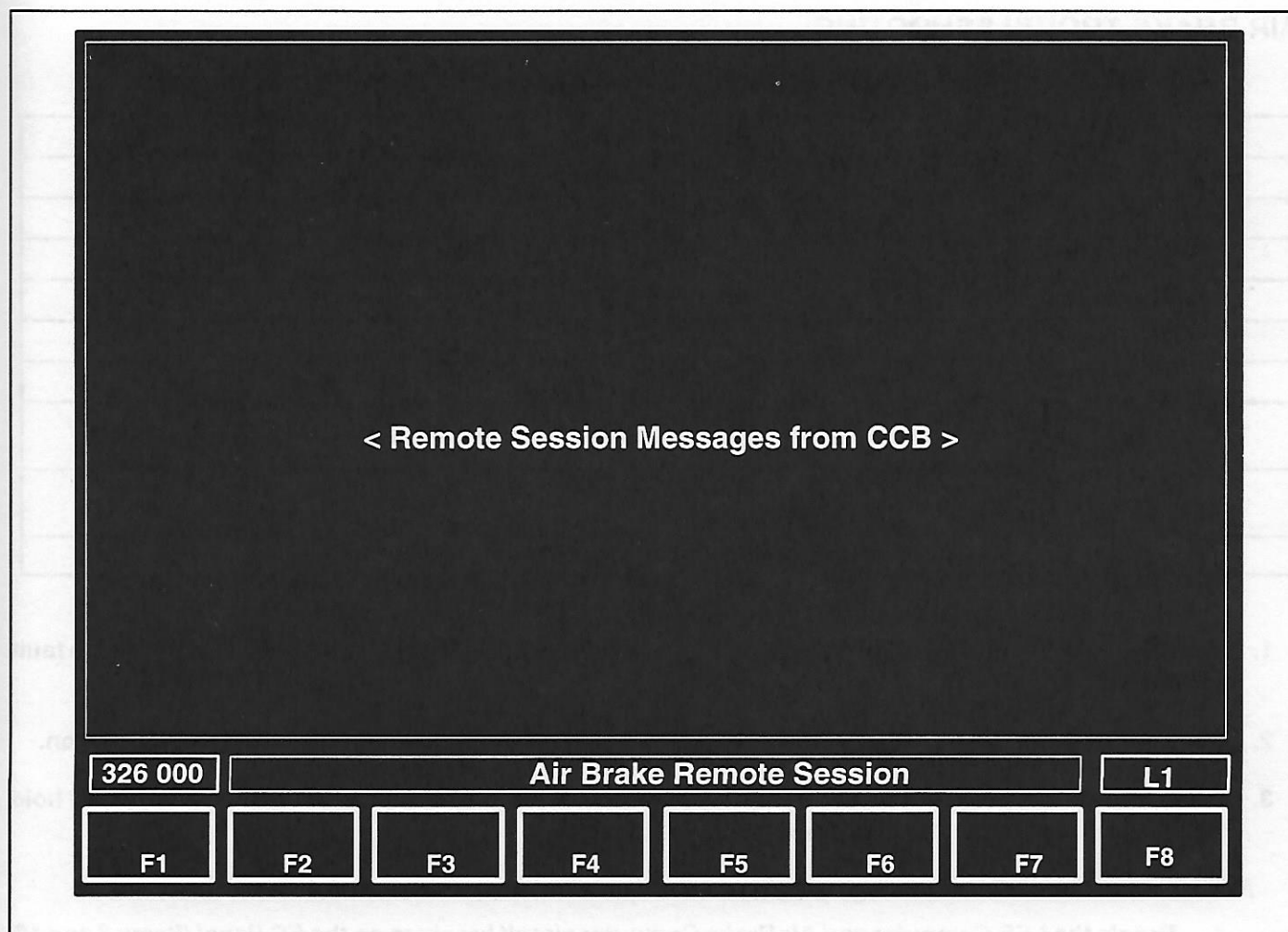


FIG. 40. ELECTRONIC AIR BRAKE REMOTE SESSION SCREEN (326 000). E-43346.

EAB REMOTE SESSION

NOTE: Keys F-1 through F-7 and the CCB Window are controlled by the EAB during Remote Session

1. Pressing keys F-1 through F-7 when active will send that keypress to the EAB.
2. Press key F-8 to return to screen 320 000.

AIR BRAKE TROUBLESHOOTING

TABLE 3. EMERGENCY OR PENALTY BRAKE WARNING INDICATIONS.

MESSAGE	INDICATION	RESET STRATEGY
OPERATOR EMERGENCY	SOLID YELLOW	1
FIREMAN EMERGENCY	SOLID YELLOW	2
TRAINLINE EMERGENCY	SOLID YELLOW	2
EOT EMERGENCY	SOLID YELLOW	2
CAB SIGNAL PENALTY	SOLID YELLOW	3
ALERTER PENALTY	SOLID YELLOW	3
AIR BRAKE POWER UP PENALTY	SOLID YELLOW	3
ILC TIME OUT (EAB CAN NOT HEAR IFC)	SOLID YELLOW	3
NOTE: Messages listed above are in order of importance.		

Reset Strategies:

1. Move Automatic Brake Handle to EMERGENCY and WAIT until the RESET message appears or the fault disappears.
2. Move AUTOMATIC Brake Handle to EMERGENCY for 60 seconds, then move to RELEASE position.
3. The operator *may* reset this failure by moving the Automatic Brake Handle to SUPPRESSION and hold for at least 10 seconds, then return handle to RELEASE.

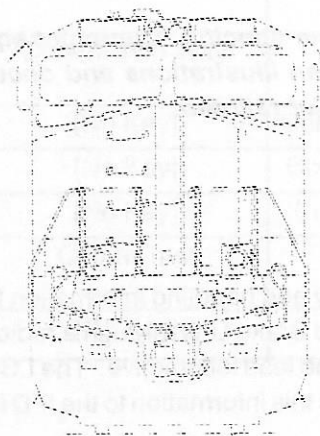
NOTE: If the above Reset Strategy does not reset the situation, proceed as follows:

1. Toggle the LEB Computer and Air Brake Computer circuit breakers on the EC Panel (Items 3 and 10, Fig. 6).
2. Move the Automatic Brake Handle to SUPPRESSION and hold for at least 10 seconds, then return handle to RELEASE.
3. If the alarm bell can not be reset or the alarm re-occurs (possible problem with Brake System), the operator should leave the circuit breaker open; the GE Harris CCBII System back-up will provide normal brake operation as a Trail Unit (Independent Brake cylinder pressure will be limited to the A&R pipe pressure).

WARNING: STOPPING HAZARD. Under no circumstances should a train be permitted to continue in operation if the brake pipe air pressure falls below 45 psi. If this situation occurs, the train must be stopped and the brake pipe recharged to the railroad particular setting. Failure to comply with this warning may result in the inability to control or stop the train.

WARNING: STOPPING HAZARD. If internal power loss and Locomotive battery power loss to the GE Harris CCBII System occurs while train is in motion, a SERVICE Brake application is made at a SERVICE rate (BP goes to zero). Operator may initiate an EMERGENCY Brake application from the EMERGENCY BRAKE VALVE located on the Crew Member's Desk.

WARNING: STOPPING HAZARD. Following an EMERGENCY BRAKE application, if the train is not at rest, brake release **MUST NOT** be attempted. Any movement of the AUTOMATIC Brake Handle to RELEASE while train is moving may cause equipment and/or personnel damage.



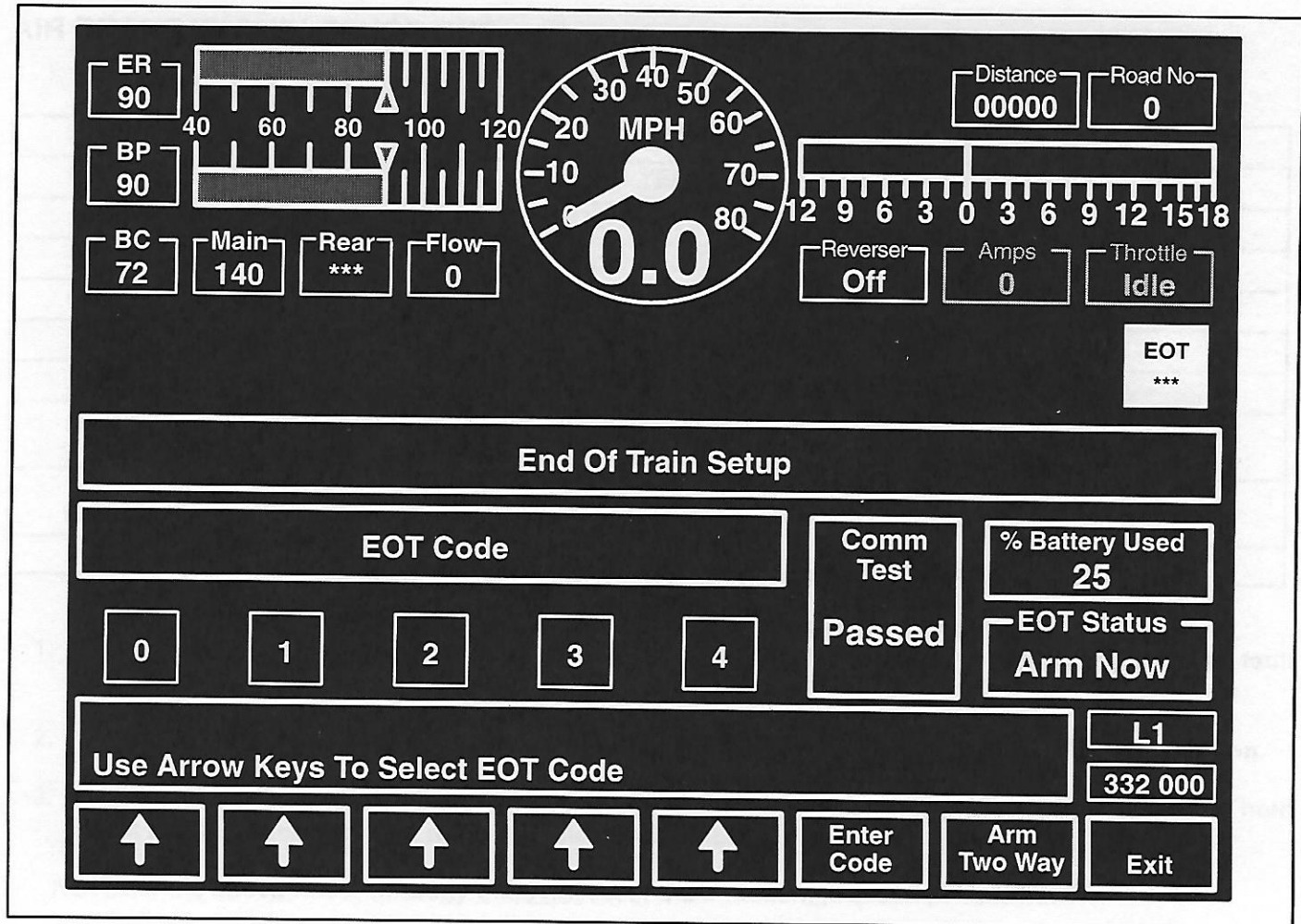


FIG. 41. END OF TRAIN SETUP SCREEN (332 000). E-43054.

NOTE: IFD screen layout is customer specific. Customer equipment requirements often differ from one railroad to another; therefore, screen illustrations and documentation may not entirely agree with the equipment furnished to any particular railroad.

INTRODUCTION

The End Of Train system monitors safety and handling information from the last car of the train. This information is sent from the EOT transmitter or Sense and Brake Unit through a radio link to the Locomotive Cab Unit (LCU) or Head Of Train (HOT) device mounted in CA1 of the lead locomotive. The LCU or HOT device then transmits this data over a serial link to the IFC system. The IFC sends this information to the IFD for operator utilization. Operator commands are sent to the EOT in reverse order.

This system allows the Railroad to gather pertinent system data, ensures adequate notification on trainline breaks and enables the Engineer to initiate a Two-Way Emergency Brake application. The EOT Setup Screen (Fig. 41) allows the operator to change the EOT ID and arm/disarm the system.

OPERATION

Pressing key position F3, **EOT Setup**, on the Operator Function Screen (screen 300 000, see Fig. 36) will display screen 332 000. Follow Railroad procedures for this operation. The active keys and a brief description of operation are as follows:

NOTE: Upon entering screen 332 000, the current active EOT Code is displayed.

1. Pressing key position F1 through F5 ("**UP**" Arrows) will enable change of the Transmitter Code (**Xmtr Code**) by digit (marker and text will go yellow).
2. Pressing key position F6 (**Enter Code**) will send the new code to the LCU or HOT and update the displayed IFD Code.

NOTE: If a wrong code is entered, the EOT COMM alarm will light for 10 seconds on the IFD screen followed by an AVB notification. Re-enter the correct code.

3. Key position F7 varies depending on system status. See **Table 4.**
4. Pressing **Exit** will return you to screen 300 000.

TABLE 4. END OF TRAIN INDICATIONS.

SBU DEVICE STATUS	EOT STATUS TEXT	KEY F7 TEXT	COMM TEST TEXT	COMMENTS
One Way	One Way	[No Key]	[Last Status]	Normal Marker
Armed	Armed	Comm Test	[Last Status]	Normal Marker And Key
Not Armed	Not Armed	Comm Test	[Last Status]	Normal Marker And Key
Disarmed	Disarmed	Comm Test	[Last Status]	Normal Marker And Key
Armed Other	Armed Other	[No Key]	[Last Status]	Yellow Marker
Arm Now	Arm Now	Arm Two Way	[Last Status]	Yellow Marker And Key
Disarm Now	Disarm Now	Disarm Two Way	[Last Status]	Yellow Marker And Key
Comm Test Running	[Last Status]	[No Key]	Comm Test Running	Normal Marker
Comm Test Passed	[Last Status]	[No Key]	Comm Test Passed	Normal Marker
Comm Test Failed	[Last Status]	[No Key]	Comm Test Failed	Normal Marker
Unknown	Unknown	Comm Test	[Last Status]	Normal Marker And Key
***	***	[No Key]	[Last Status]	Normal Marker

OPERATING PROCEDURE

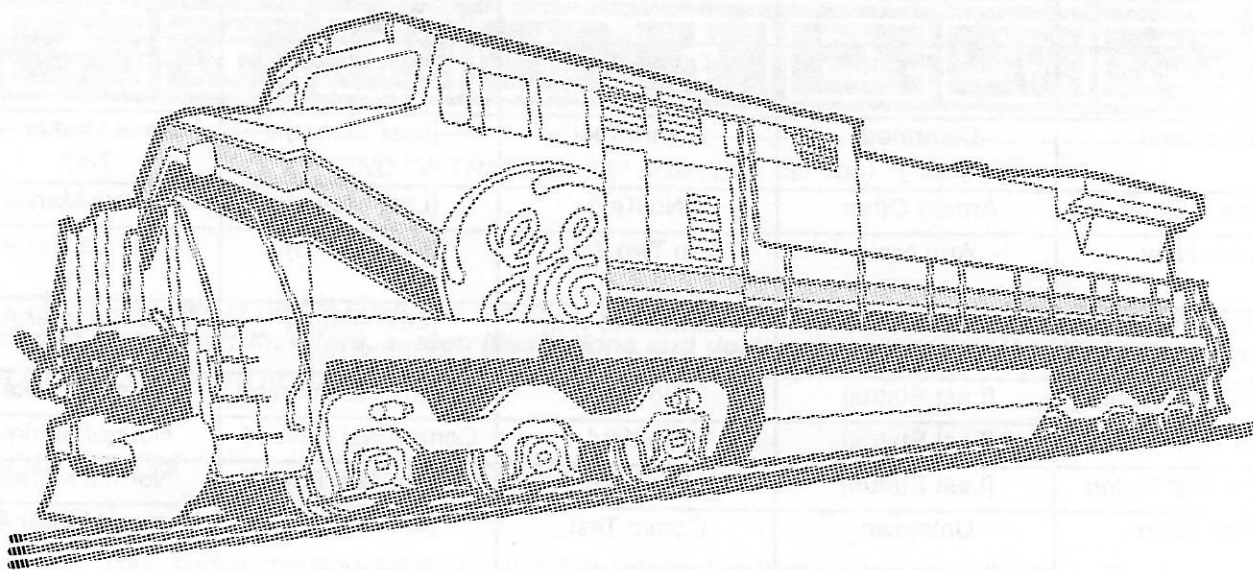
1. Press key position F3, **EOT Setup**, on the Operator Function Screen (screen 300 000, see Fig. 36). Screen 332 000 will appear on the IFD.
2. If EOT Transmitter Code (**Xmtr Code**) is not correct, change the code as follows:
 - a. Change code by digit using key positions F1 through F5 ("**UP**" Arrows).

- b. Once correct code is displayed on the screen, press F6 (**Enter Code**) to send the new code to the LCU or HOT and update the displayed IFD EOT Code.
- c. Press arm or test button on the EOT device.

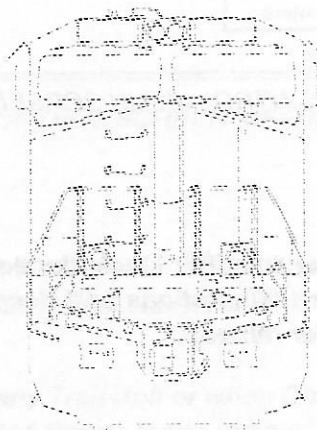
NOTE: Once the EOT device is armed successfully, the EOT Status block will read Arm Now and soft key F7 will read Arm Two Way. The operator has five seconds to press the F7 key to arm the system.

- d. Once the **Arm Two Way** key appears, arm the system by pressing the F7 key within five seconds. If successful arming is not obtained within five seconds, the screen will revert to existing screen before F7 key had been pressed. Try arming the system again.
3. Press key position F8, **Exit**, to return to screen 300 000.

NOTE: Trigger the End Of Train Emergency Brake by pressing the spring-loaded toggle switch on the Control Console (Item 4, Fig. 3). Follow Railroad Rules and Regulations for operation of this switch.



SPEED CONTROL



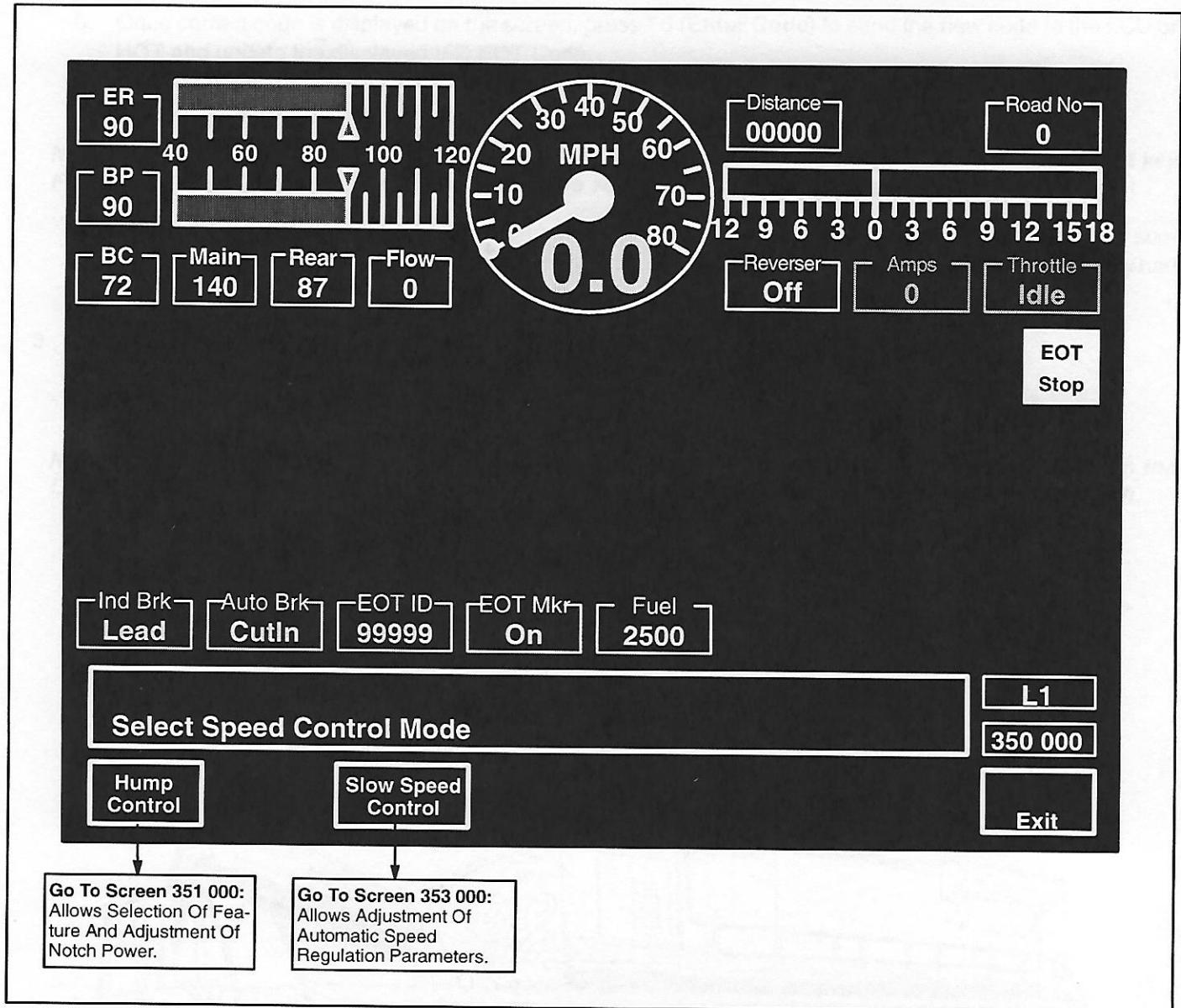


FIG. 42. SPEED CONTROL MENU SCREEN (350 000). E-43465.

NOTE: IFD screen layout is customer specific. Customer equipment requirements often differ from one railroad to another; therefore, screen illustrations and documentation may not entirely agree with the equipment furnished to any particular railroad.

INTRODUCTION

There are two optional programs (Fig. 42) which enable the operator to have finer speed control of locomotive operations for loading/unloading similar to a pacesetter or a hump control feature. These programs are discussed in the **OPERATION** Section that follows.

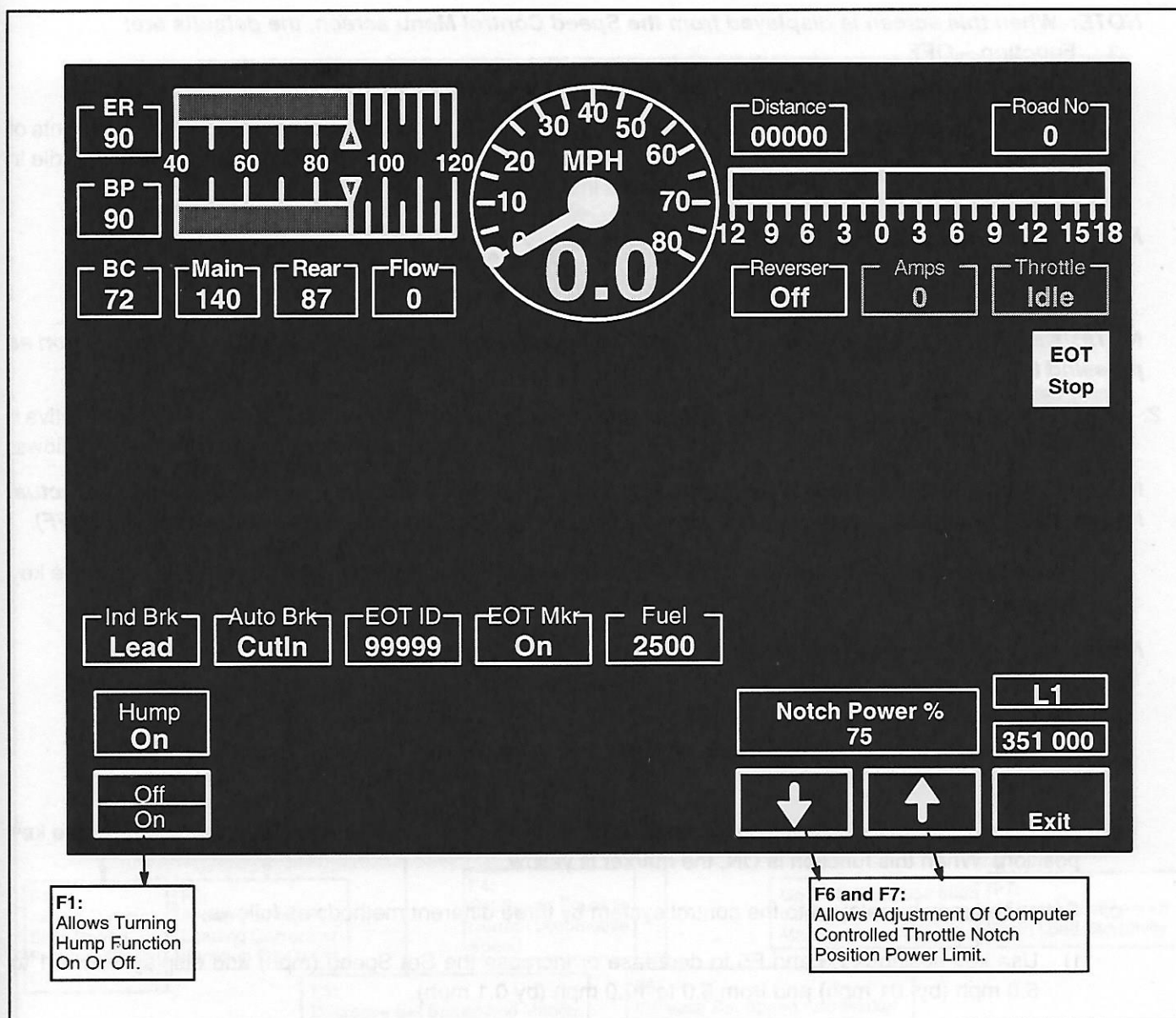


FIG. 43. HUMP CONTROL SCREEN (351 000). E-43466.

OPERATION

Pressing key position F5, **Speed Control**, on the Operator Function Screen (screen 300 000, see Fig. 36) will display screen 350 000. *Follow Railroad Procedures for this operation.* The active keys and a brief description of operation are as follows:

NOTE: This screen is NOT available on any Trail Unit or when Distributed Power is in use. However, slow speed operation is available in Distributed Power Mode (with or without remotes).

1. Pressing key position F1 (**Hump Control**) will bring up screen 351 000 (Hump Control – see Fig. 43). This key is active at any speed. Four keys are active on this screen as follows:
 - a. Press key position F1 (**On/Off**) to toggle the function ON/OFF. Function status is indicated above the key position. When this function is ON, the marker is yellow.

NOTE: When this screen is displayed from the Speed Control Menu screen, the defaults are:

1. Function – OFF.
2. Notch Power % – Last set value (100% on initial power-up).
- b. Use key positions F6 and F7 to decrease or increase the Notch Power (%) limit and display in increments of 5% with an available range of 0 to 100%. For example: Setting this at 50% and placing **Throttle** Handle in Notch 1 will give you approximately 150 Amps instead of the normal 300 Amps.

NOTE: Operator can change Notch Power % with this function ON or OFF.

- c. Press **Exit** to return the operator to screen 300 000, Operator Functions.

NOTE: Centering the Reverse Handle or applying dynamic brakes has the same affect on this function as pressing the OFF key.

2. Pressing key position F3 (**Slow Speed Control**) will bring up screen 353 000 (see Fig. 44). This key is active if and only if the locomotive speed is less than or equal to 15.0 mph. Eight keys are active on this screen as follows:

NOTE: This screen is NOT available on any Trail Unit. Also, the Speed Reference Gage tracks the actual locomotive mph against the set mph when this function is ON (bar disappears when function is OFF).

- a. Press key position F1 (**On/Off**) to toggle the function ON/OFF. Function status is indicated above the key position. When this function is ON, the marker is yellow.

NOTE: When the screen is displayed from the Slow Speed Control Menu screen, the defaults are:

1. Function – OFF.
2. Plug – last set value.
3. Set Speed – Last set value (0 mph on initial power-up).
4. Set Train Load is Light.
- b. Press key position F2 (**On/Off**) to toggle the function ON/OFF. Function status is indicated above the key position. When this function is ON, the marker is yellow.
- c. Set speed may be relayed to the control system by three different methods as follows:
 - 1) Use key positions F3 and F5 to decrease or increase the Set Speed (mph) and display from 0.1 to 5.0 mph (by .01 mph) and from 5.0 to 10.0 mph (by 0.1 mph).
 - 2) Pressing key position F4 (**Current Speed**) will set the target speed to the current locomotive speed. Adjust to the desired speed using key positions F3 and F5.
 - 3) Pressing key position F6 (**Set Speed**) will bring up screen 353 600 (see Fig. 45). Set Speed may be increased or decreased in 0.01, 0.10 or 1.00 mph increments.

NOTE: To increase or decrease the Set Speed in 0.01 mph increments, the Set Speed must be less than 5.0 mph.

- d. Use key position F7 (**Train Load**) to toggle the Train Load and Marker (Light/Med/Heavy). When starting to "Load Out" a train, begin with the setting at **Light**. Around 30 loaded cars or sooner if the train speed tends to lag behind the set target speed and the target speed cannot be reached (on a two locomotive consist), switch the setting to **Medium**. After about 70 loaded cars (on a two locomotive consist), switch the setting to **Heavy** and complete the loading process.

NOTE: Using "Set Train Load" adjusts the computers sensitivity or speed that the system reacts to a change.

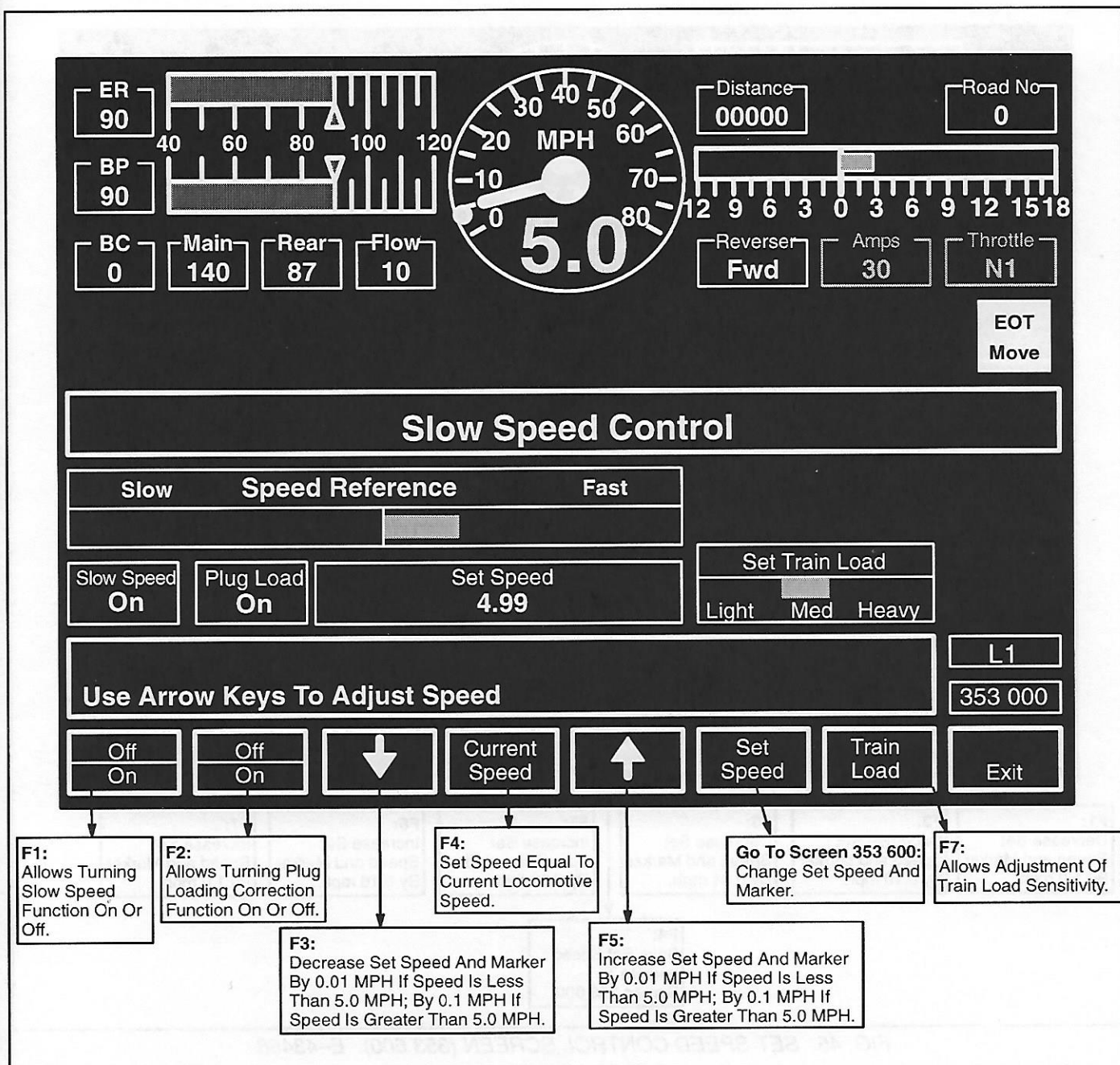


FIG. 44. SLOW SPEED CONTROL SCREEN (353 000). E-43467.

- e. Press **Exit** to return the operator to screen 300 000, Operator Functions. The last set speed will be retained by the controller and this set speed will be the starting point the next time the Speed Control Function is used.
3. Pressing key position F8 (**Exit**) will return the operator to screen 300 000, Operator Functions.

NOTE: The operator may need to increase the *Throttle* handle position to increase the power output to maintain speed. General Electric suggests starting in Notch 4 and increase power accordingly. Traction Motor #2 may be cut-out to improve performance if wheelslip activity is present.

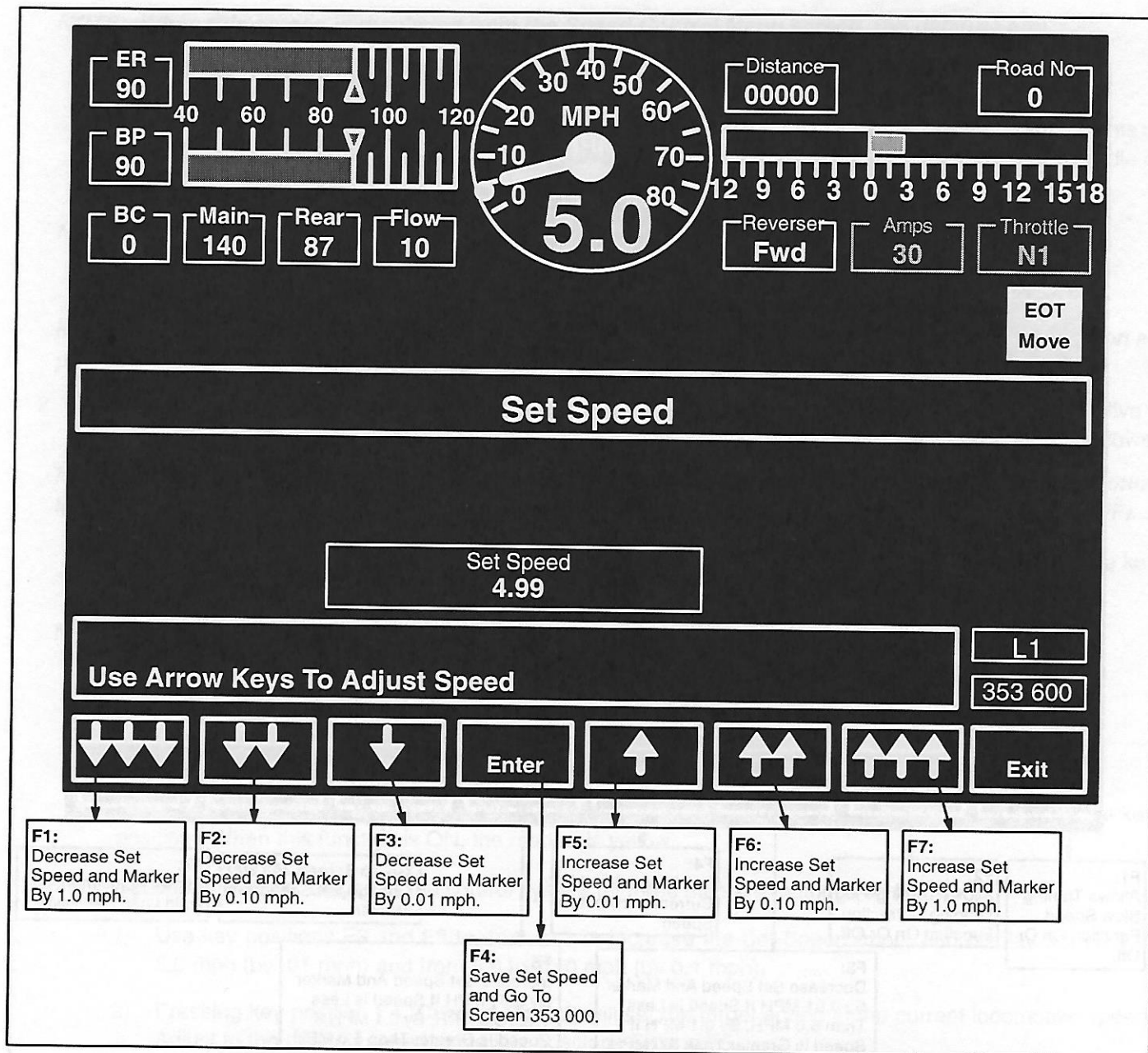
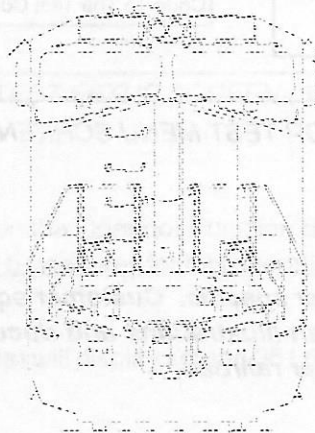


FIG. 45. SET SPEED CONTROL SCREEN (353 600). E-43468.

OPERATOR TEST MENU



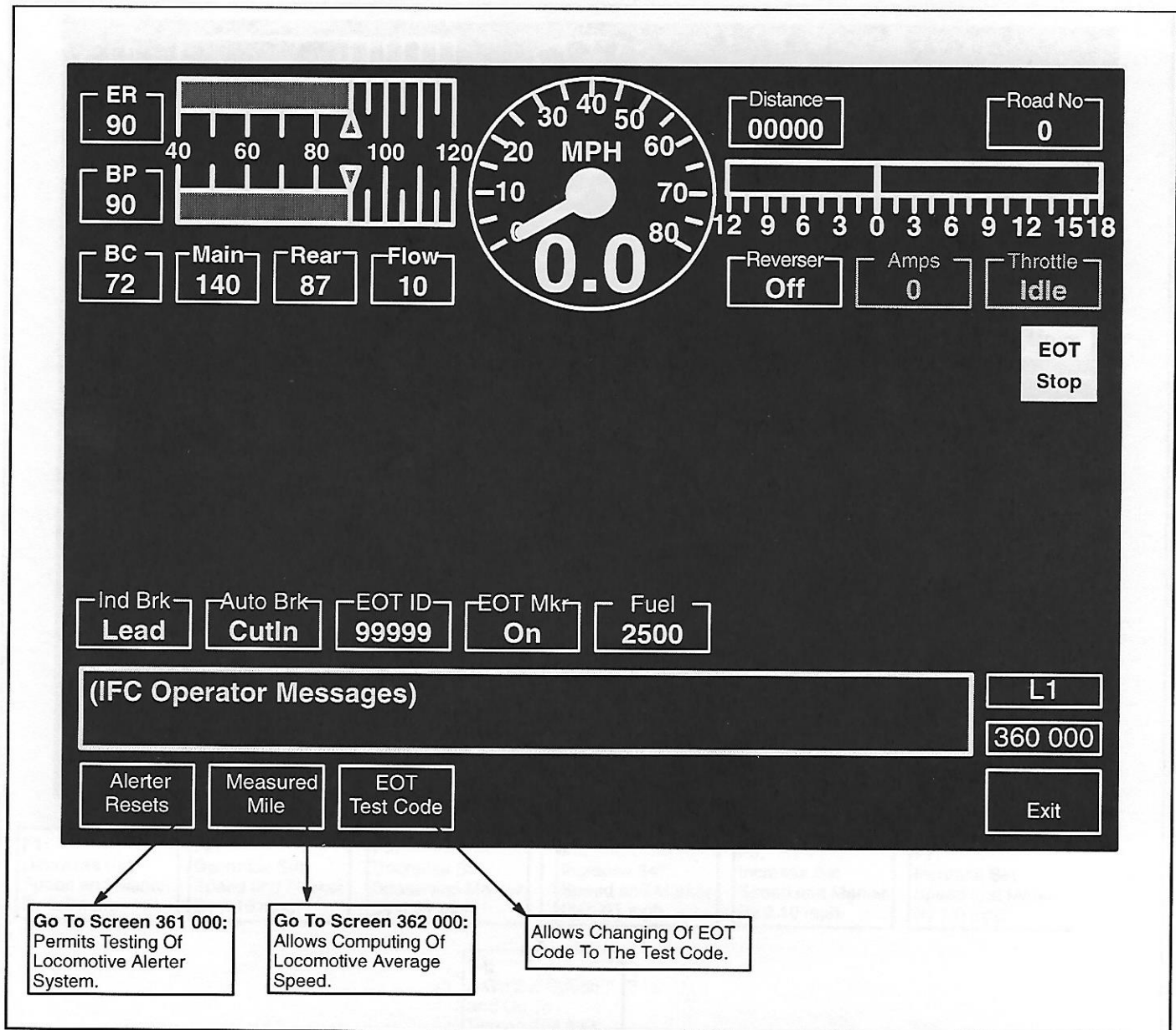


FIG. 46. OPERATOR TEST MENU SCREEN (360 000). E-42516A.

NOTE: IFD screen layout is customer specific. Customer equipment requirements often differ from one railroad to another; therefore, screen illustrations and documentation may not entirely agree with the equipment furnished to any particular railroad.

INTRODUCTION

The Operator Test Menu (Fig. 46) is a series of optional programs giving the operator a means to test various locomotive operating systems (eg., perform a Measured Mile Test).

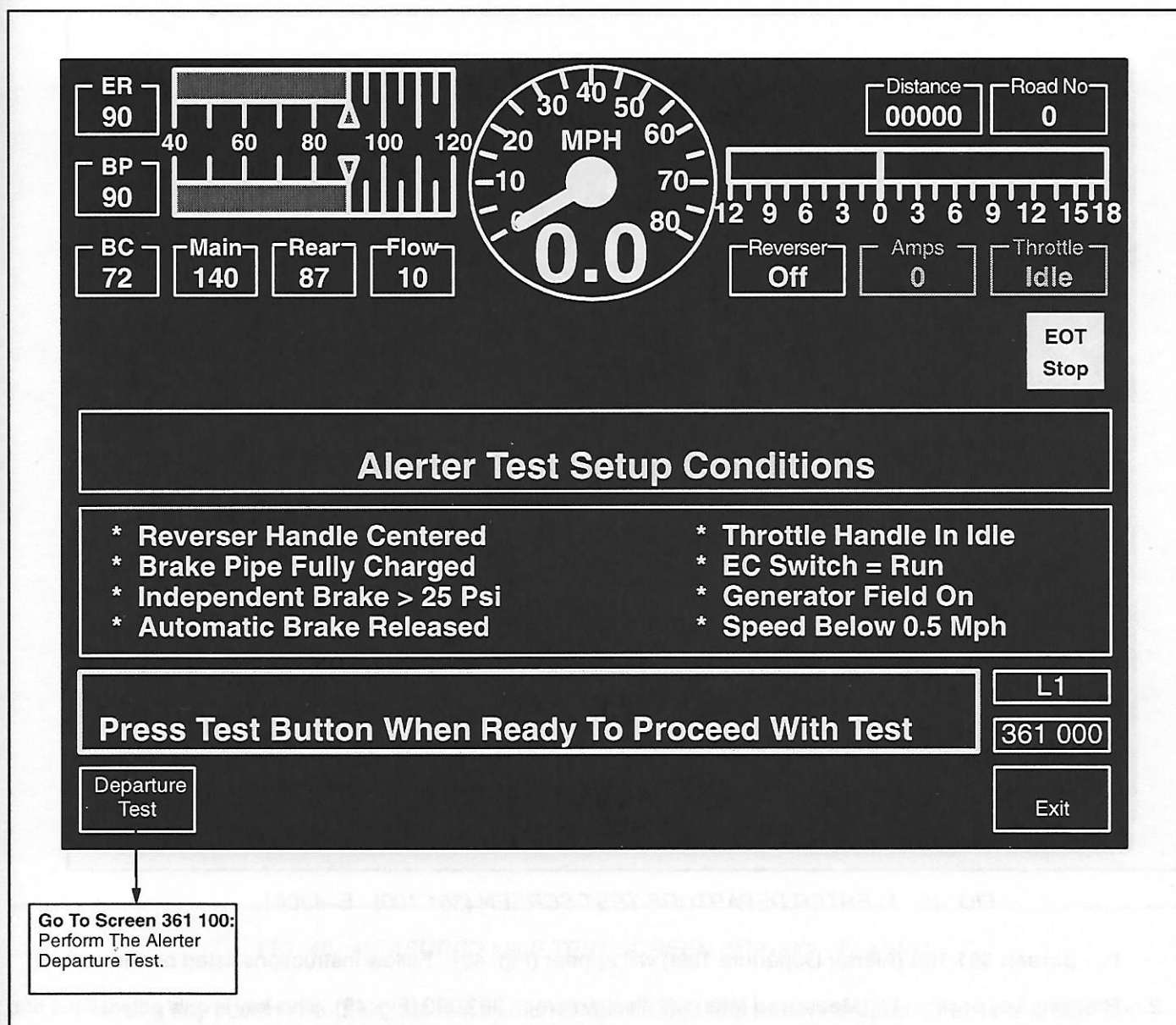


FIG. 47. ALERter TEST SETUP SCREEN (361 000). E-43060.

OPERATION

Pressing key position F6, **Operator Tests**, on the Operator Function Screen (screen 300 000, see Fig. 36) will display screen 360 000 (Fig. 46). Follow Railroad procedures for this operation. The active keys and a brief description of operation are as follows:

1. Pressing key position F1 (**Alerter Resets**) will display screen 361 000 (Fig. 47). This key is only active if the unit speed is less than 0.5 mph.

NOTE: Pressing **Exit** Key at any time during the following procedures will cancel the Alerter Test and return the operator to Screen 300 000.

- a. Screen 361 000 will list Test Setup Conditions. Ensure these conditions are met and press F1, **Departure Test**.

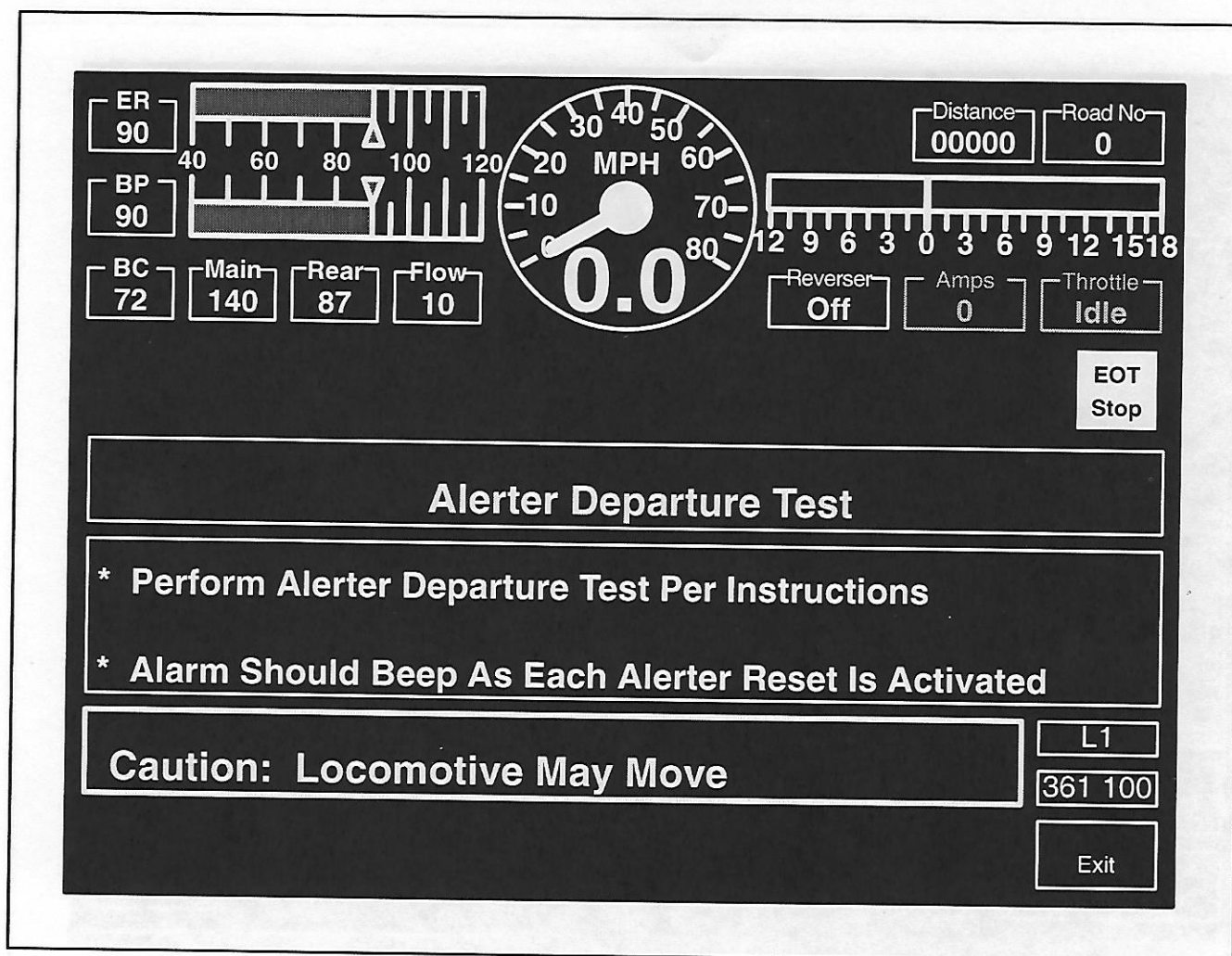


FIG. 48. ALERTER DEPARTURE TEST SCREEN (361 100). E-43061.

- b. **Screen 361 100** (Alerter Departure Test) will appear (Fig. 48). Follow instructions listed on the screen.
2. Pressing key position F2 (**Measured Mile**) will display screen 362 000 (Fig. 49). This key is only active if the unit speed is greater than 3.0 mph.

NOTE: Accuracy of this test depends upon maintaining a constant speed throughout the measured mile.

- a. At beginning of measured mile press F1, **Start Mile**. The Operator message area will read "Test Started ... Waiting For Stop Button". The **Start Mile** button will disappear as the test is running.
 - b. Upon the end of the measured mile press F2, **Stop Mile**. The computer will stop the test and compute the average speed. The **Stop Mile** button will disappear after it is pressed. The **Start Mile** button will return.
 - c. The Operator message area will read "Average Speed For The Mile Was xxx.x Mph".
 - d. **Exit** will return the operator to screen 300 000.
3. Pressing key position F3 (**EOT Test Code**) will set the End Of Train Device identification code to 05000. Once Test Code has been selected, F3 will read **Restore EOT Code** in yellow. Press this key or **Exit** to restore the former code.

NOTE: This key is only active if the unit speed is below 0.5 mph.

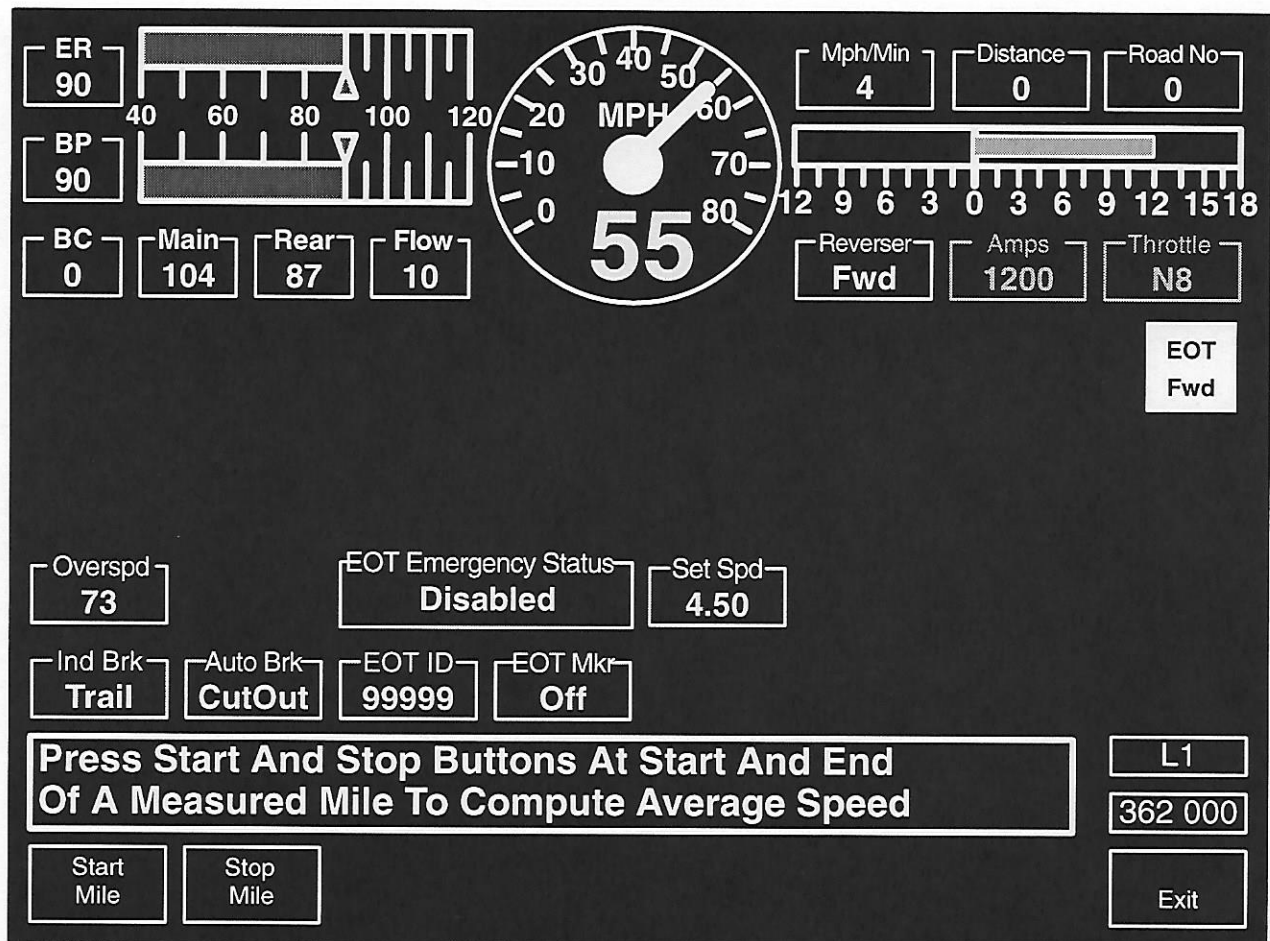
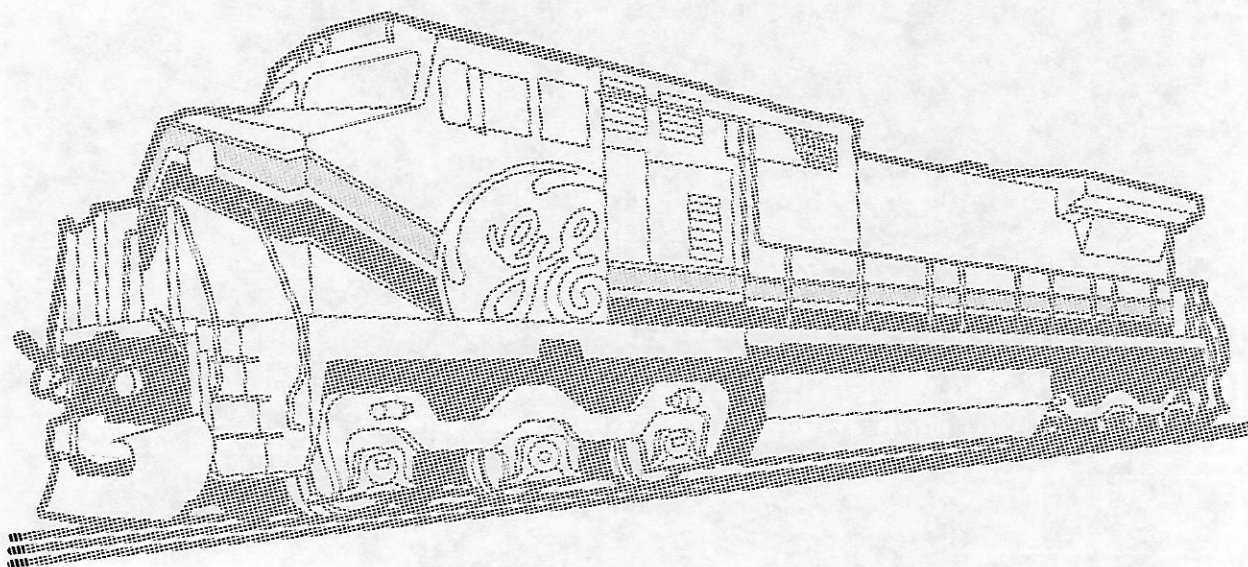
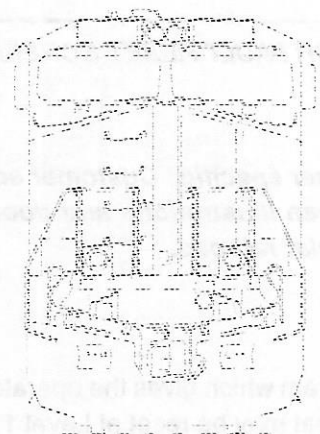


FIG. 49. MEASURED MILE TEST SCREEN (362 000). E-43062.

4. Pressing key position F8 (**Exit**) will restore normal EOT Code and return the operator to screen 300 000.



OPERATOR FAULT RESET



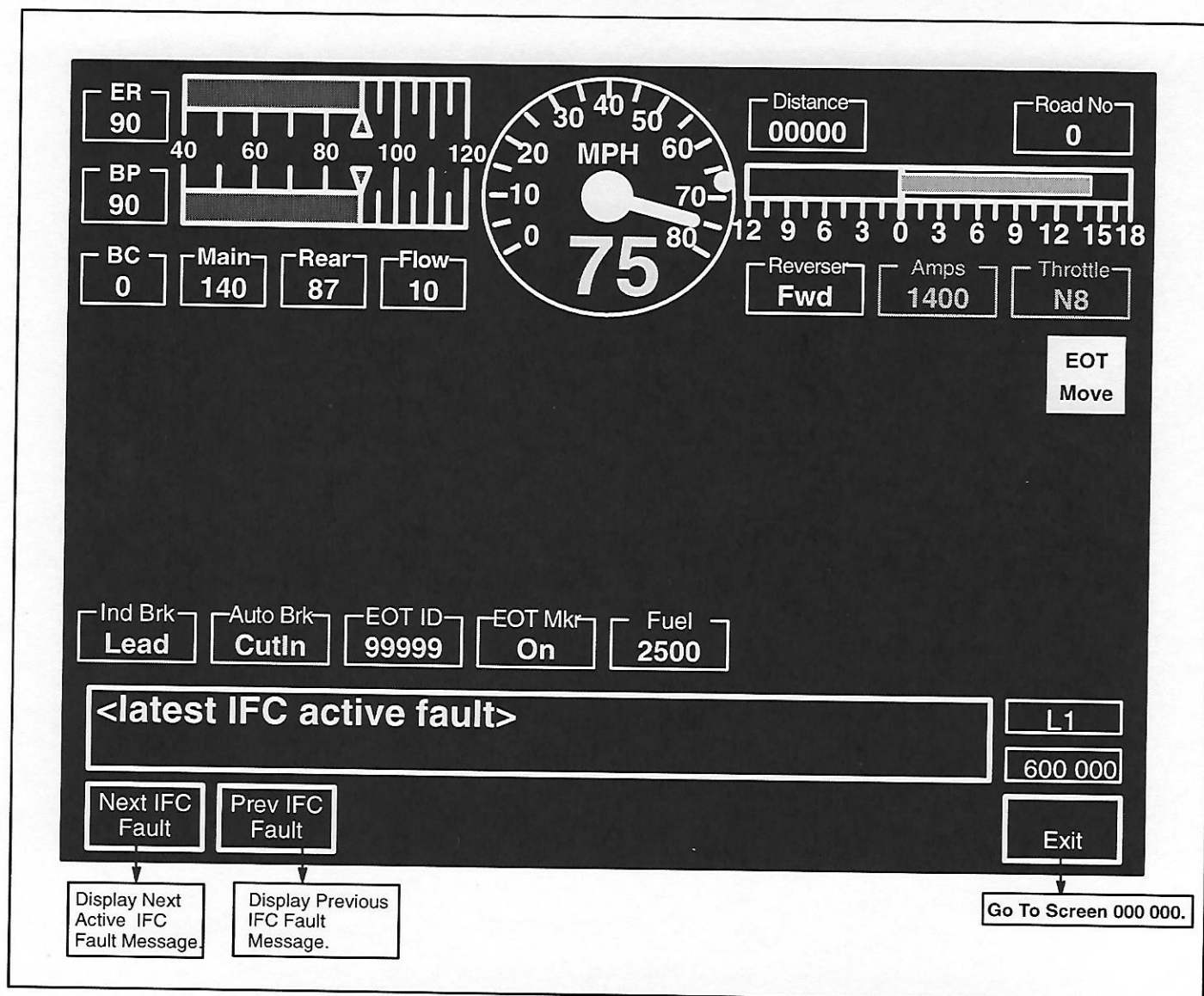


FIG. 50. OPERATOR FAULT RESET SCREEN (600 000). E-42520A.

NOTE: IFD screen layout is customer specific. Customer equipment requirements often differ from one railroad to another; therefore, screen illustrations and documentation may not entirely agree with the equipment furnished to any particular railroad.

INTRODUCTION

Operator Fault Reset (Fig. 50) is a program which gives the operator the ability to review and reset certain IFC and CAB active faults. Only the active faults that may be reset at Level 1 will be shown. All active faults are displayed in chronological order, newest first. If there are no resettable active faults, operator message line will read either "No IFC Faults At This Level" or "No CAB Faults At This Level", or both.

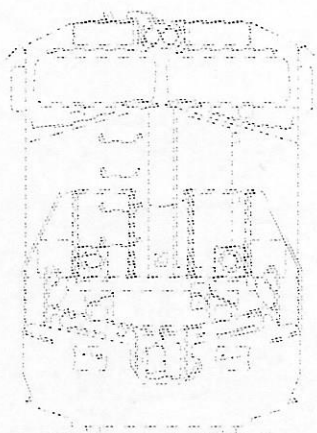
NOTE: At this time there are no IFC faults which can be reset by the operator. Therefore, keys F1, F2 and F3 will NOT be displayed on the screen.

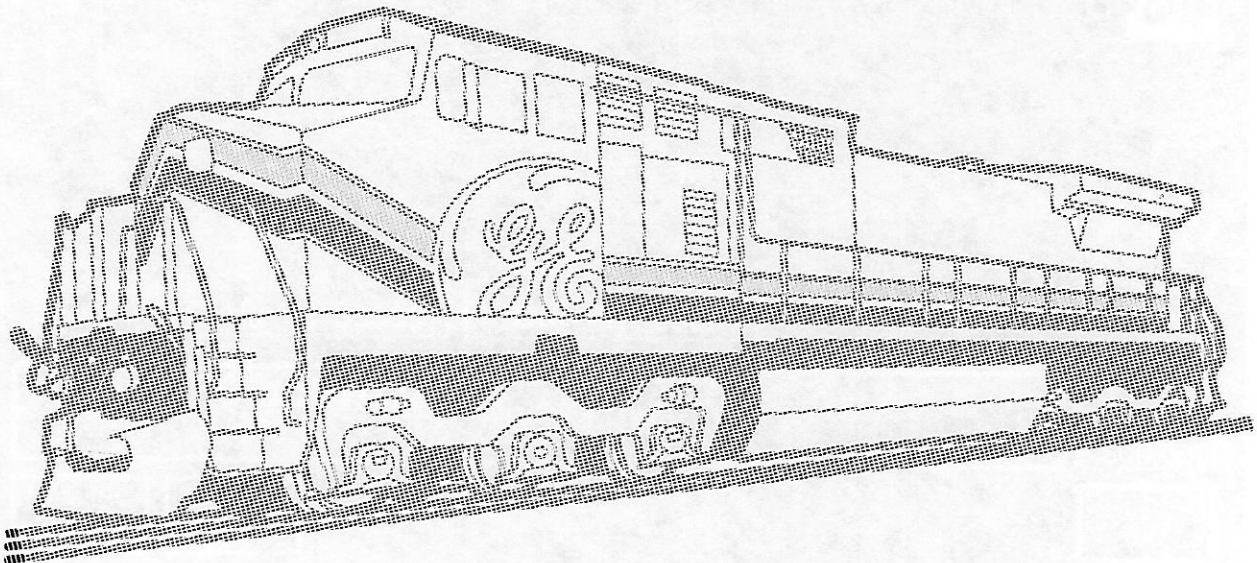
OPERATION

Pressing key position F6, **Reset Faults**, on the Main Operation Screen (screen 000 000, see Fig. 35) will display screen 600 000. The active keys and a brief description of operation are as follows:

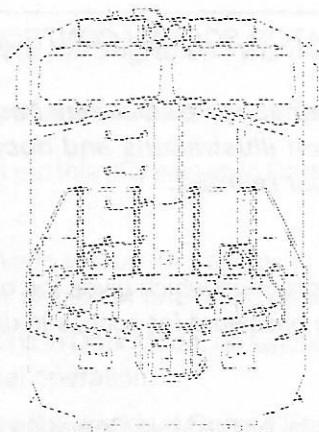
NOTE: Upon entering Screen 600 000, the active resettable faults will be shown in chronological order (latest first). If there are no more active faults, the screen will read "No More Faults" for three seconds then return to screen 000 000.

1. Pressing key position F1 (**Next IFC Fault**) will display the next active IFC fault message.
2. Pressing key position F2 (**Prev IFC Fault**) will display the previous active IFC fault message.
3. Pressing key position F8 (**Exit**) will return the operator to the Main Operation Screen (000 000).





OPERATOR SCREEN CONTROLS



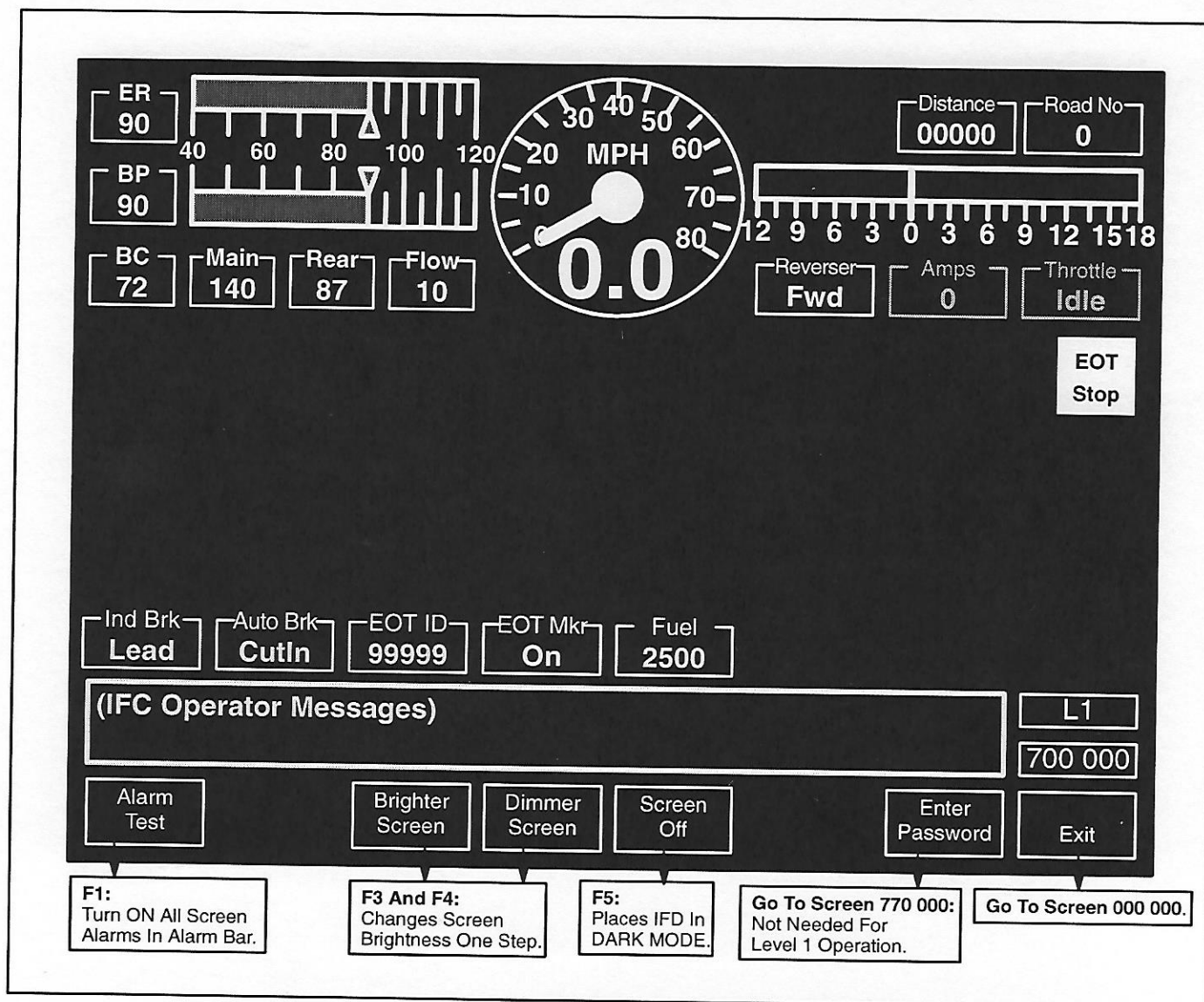


FIG. 51. OPERATOR SCREEN CONTROLS (700 000). E-4.

NOTE: IFD screen layout is customer specific. Customer equipment requirements often differ from one railroad to another; therefore, screen illustrations and documentation may not entirely agree with the equipment furnished to any particular railroad.

INTRODUCTION

Operator Screen Controls (Fig. 51) is a program which gives the operator the ability to change IFD screen brightness, test all screen alarms and/or change password for access to different operating levels.

OPERATION

Pressing key position F7, **Screen Controls**, on the Main Operation Screen (screen 000 000, see Fig. 35) will display screen 700 000. The active keys and a brief description of operation are as follows:

1. Pressing key position F1 (**Alarm Test**) will order the IFC computer to turn ON all screen alarms in the AAR alarm bar for five seconds. After the five seconds, the screen will return to normal operating condition.
2. Pressing key position F3 (**Brighter Screen**) will increase the screen brightness one step.

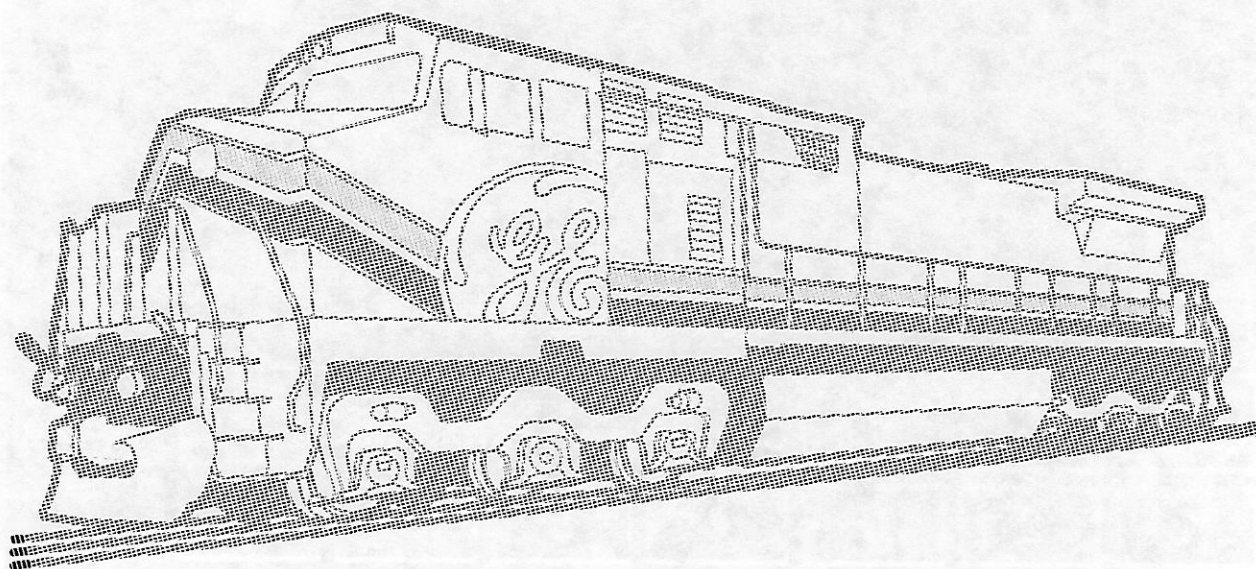
The screen displays the following information:

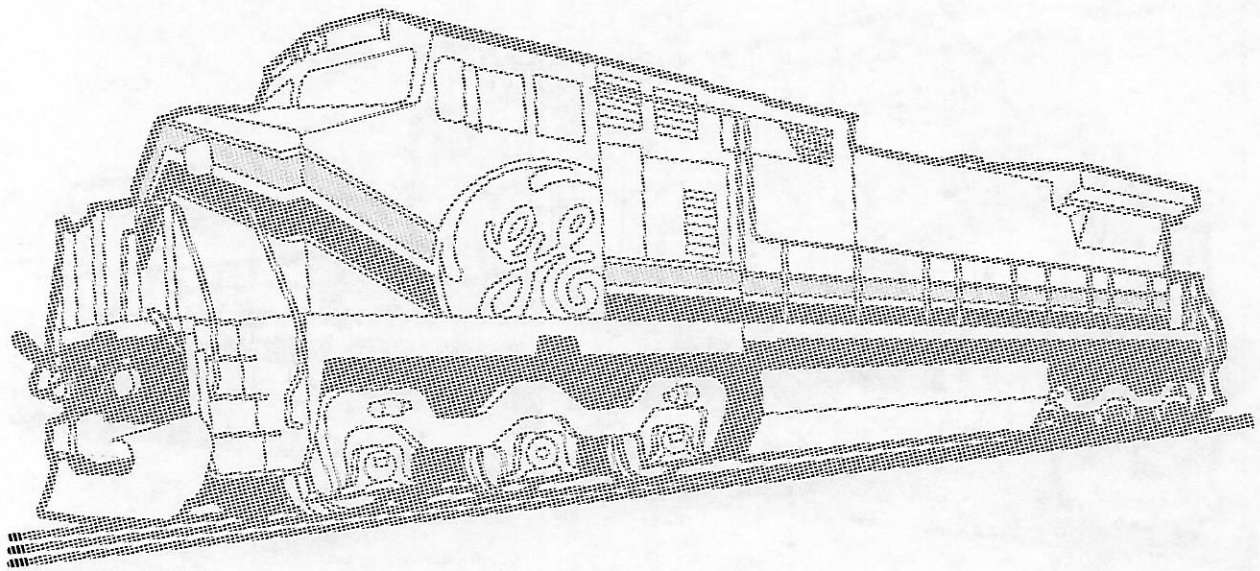
- ER 90**, **BP 90**, **BC 72**, **Main 140**, **Rear 87**, **Flow 10**
- Distance 00000**, **Road No 0**
- Reverser Fwd**, **Amps 0**, **Throttle Idle**
- EOT Stop**
- Ind Brk Lead**, **Auto Brk CutIn**, **EOT ID 99999**, **EOT Mkr On**, **Fuel 2500**
- Enter Password For Desired Level**
Press "Enter" Key When Complete . . . XXXXXXXX
- L1**, **770 000**
- 1**, **2**, **3**, **4**, **5**, **Enter**, **Delete**, **Exit**

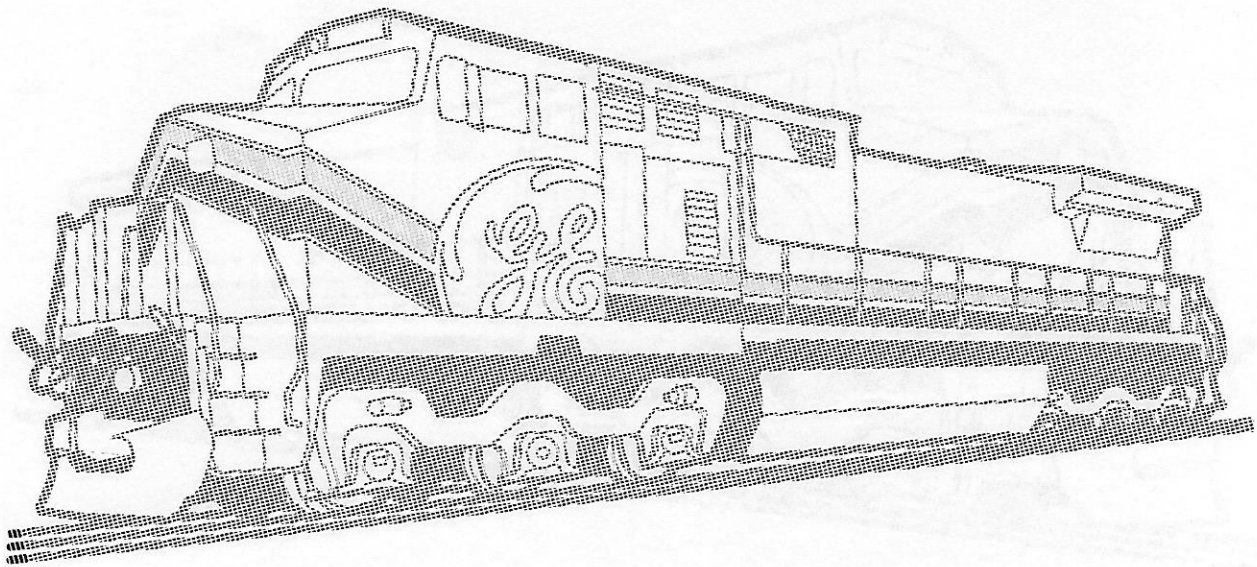
FIG. 52. OPERATOR PASSWORD SCREEN (770 000). E-42522A.

NOTE: Using this key to bring the screen to full brightness will disable the automatic brightness function.

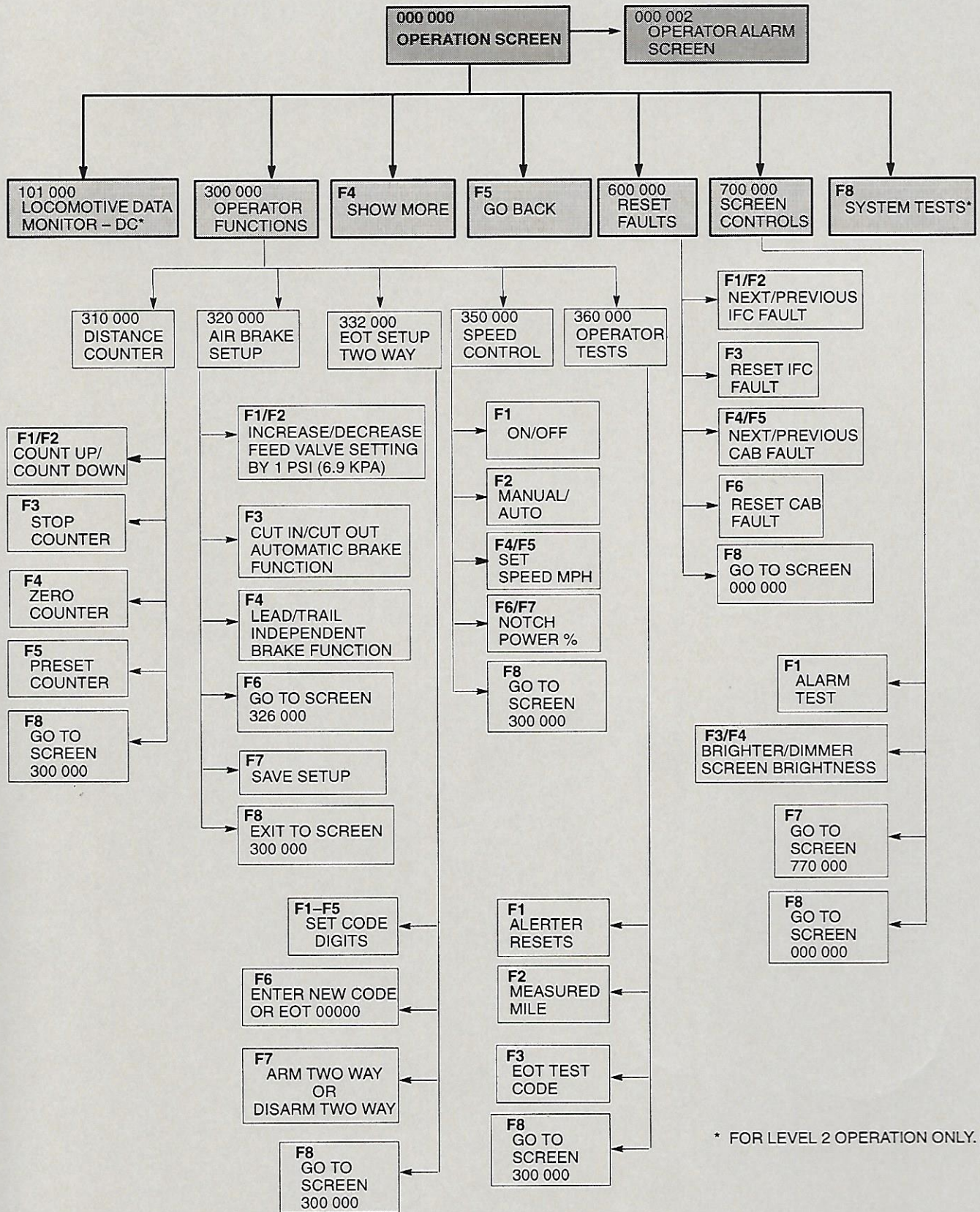
3. Pressing key position F4 (**Dimmer Screen**) will decrease the screen brightness one step.
4. Pressing key position F5 (**Screen Off**) will put this IFD screen in Dark (Sleep) Mode until any soft key is pressed. Note the following for this function:
 - a. This key is only active if the locomotive is set-up for Lead (with **Reverse** Handle in any position other than Off) and this IFD is the Crew Member display or one of the operator displays is **not** already in Dark Mode.
 - b. If any soft key is pressed while this IFD is in Dark Mode, no function is performed other than to restore screen to 50% brightness and resume normal operation.
 - c. Trail locomotives will continue to have the standard Screen Saver Mode.
 - d. If the IFC power is cycled, the Dark Mode is cancelled and the IFD will return to full brightness.
4. Pressing key position F7 (**Enter Password**) will display screen 770 000 (Fig. 52). This screen is used to gain access to the different IFC operating levels and is not needed in Level 1 operation.
5. Pressing **Exit** will return the operator to screen 000 000.







IFD SCREEN FLOW CHART



* FOR LEVEL 2 OPERATION ONLY.



***GE Transportation
Systems***

*2901 East Lake Road
Erie, Pennsylvania 16531*